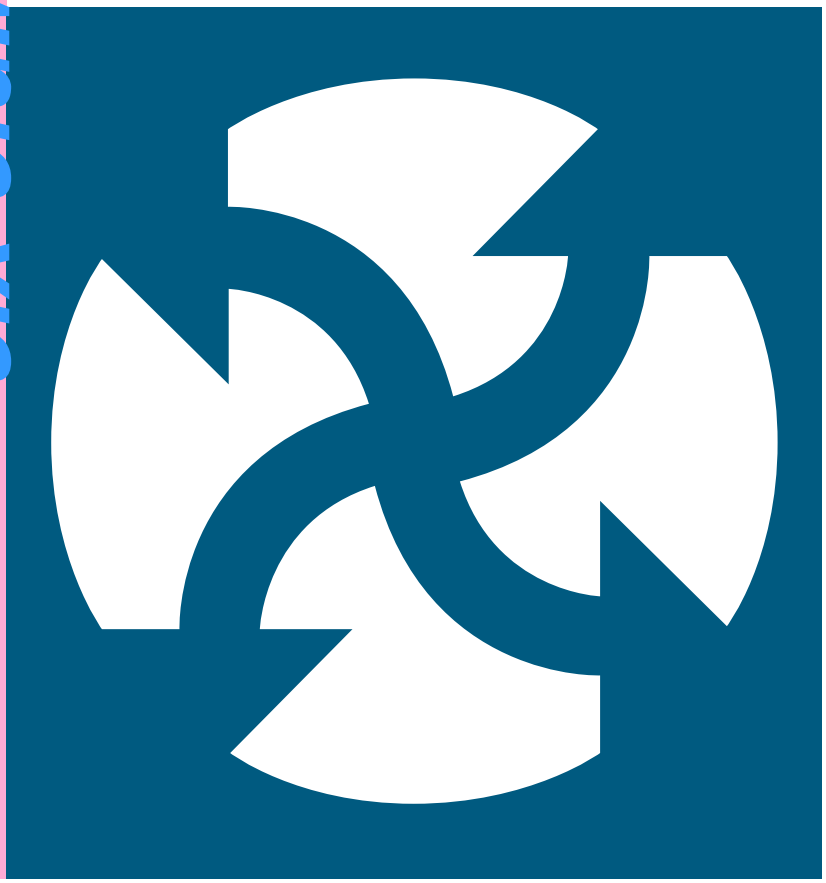
SIX SIGMA LEADERSHIP

Workshop Introduction



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Agenda

1. **Introduction**
   - Welcome, objectives
2. **What & Why Six Sigma?**
   - Six Sigma core concepts
   - What can your organization gain?
3. **How to Begin the Six Sigma Initiative?**
   - Roadmap, Leadership and Roles, Process Management
   - Processes, Customer Requirements and Measures
4. **How to Select & Manage Projects?**
   - Project selection & scoping
   - DMAIC Process & Tools
5. **Action Planning for Six Sigma**
   - Key decisions & Next Steps

Session Objectives

What you'll gain...

- **A background and basic understanding of Six Sigma as a management system**
- **Learn/discuss how it applies to and will benefit your organization**
- **Keys for successful implementation and leadership roles**
- **Outline next steps: learning, planning, doing**

Launching 6σ

Six Sigma must be adapted & implemented to fit the business, goals and strategy

Individually note one or two key questions you have about Six Sigma and how to make it successful in your organization

We'll list and discuss your questions through the course of the workshop ...

SIX SIGMA LEADERSHIP

What & Why Six Sigma

THE FOUNDATION

Six Sigma is…

- A **Measure** to define the capability of a process
- A **Goal** for improvement that reaches near-perfection
- A **System of management** to achieve lasting business leadership and top performance

…applied to benefit your customers, employees & shareholders!

Six Sigma: Measure & Goal

σ	DPMO	Yield
6	3.4	99.9997%
5	233	99.977%
4	6,210	99.379%
3	66,807	93.32%
2	308,537	69.2%
1	690,000	31%

Defects per Million Opportunities

Six Sigma began at Motorola in the late 1980s primarily as a way to consistently measure process performance. The Sigma measurement system—which we'll look at in detail later in this workshop—is based on comparing activities on a single factor: the number of "defects" produced.

Along with a way to measure performance, Motorola identified SIX Sigma as a valid and ambitious *goal* to achieve high levels of performance and customer satisfaction.

A *defect* in Six Sigma is defined as:

> *Any failure to meet a key requirement of an external (that is, paying) customer.*

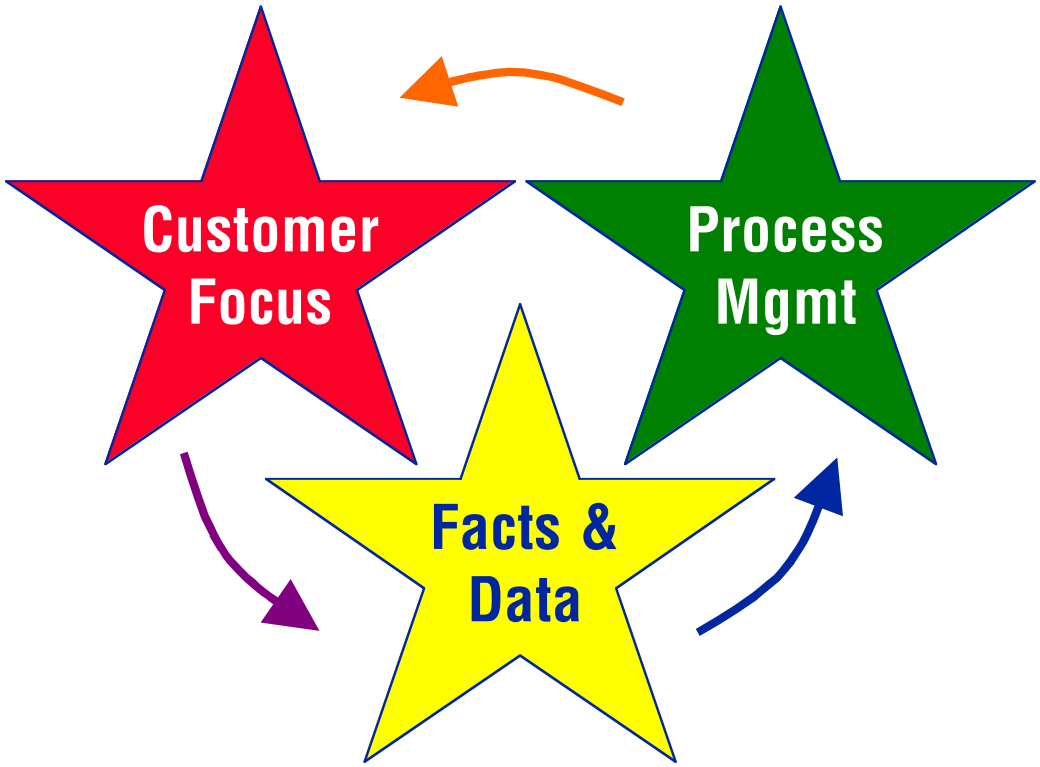
Six Sigma practitioners often refer to external customer requirements as "CTQs"—for "Critical to Quality" factors.

By adjusting the Sigma calculation based on the complexity of the process or product being measured, Sigma measurement helps you more accurately compare the performance of one process to another. This chart shows the three ways commonly used to describe Sigma measures:

- **Sigma:** A scale based on the variation in the process
- **Defects per Million Opportunities or "DPMO":** Measure that reflects how many mistakes would occur over 1,000,000 activities
- **Yield:** The proportion of the work that gets done right (that is, with no defects)

The *goal* of Six Sigma is equal to just 3.4 DPMO or a Yield of 99.9997%.

Six Sigma: A SYSTEM



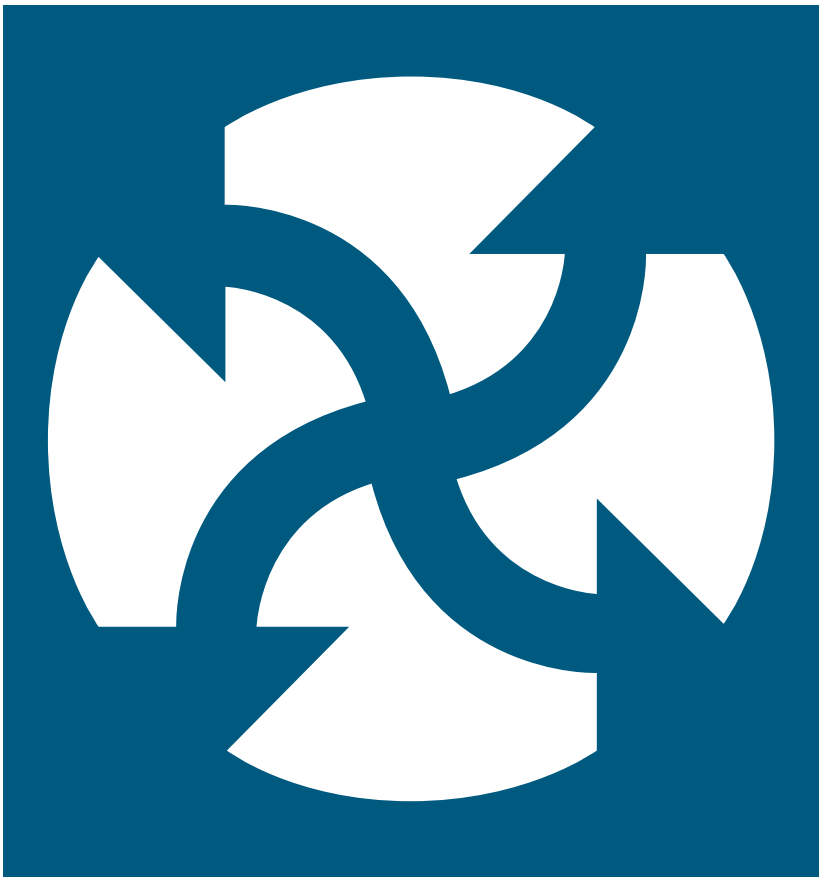
Six Sigma: A SYSTEM

- **21st Century approach to competitive success**

  Making Change a Core Competency!

- **Integrates many tools, concepts & "best practices"**
- **Involves BOTH practical/analytical and creative skills and talent**
- **Tailored to the process, business or problem!**

Key Concept & Strategies Overview



Bringing the Customer into Focus

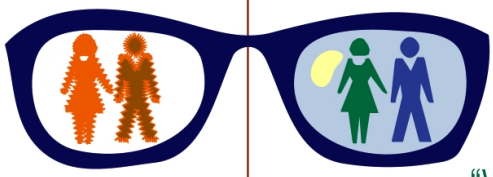
Without Six Sigma Discipline ...

Conjecture/assumption about what customers want.

Processes based on our convenience/cost.

Limited efforts at tracking customer satisfaction.

Customer-focused data not communicated or used.



With Six Sigma Discipline ...

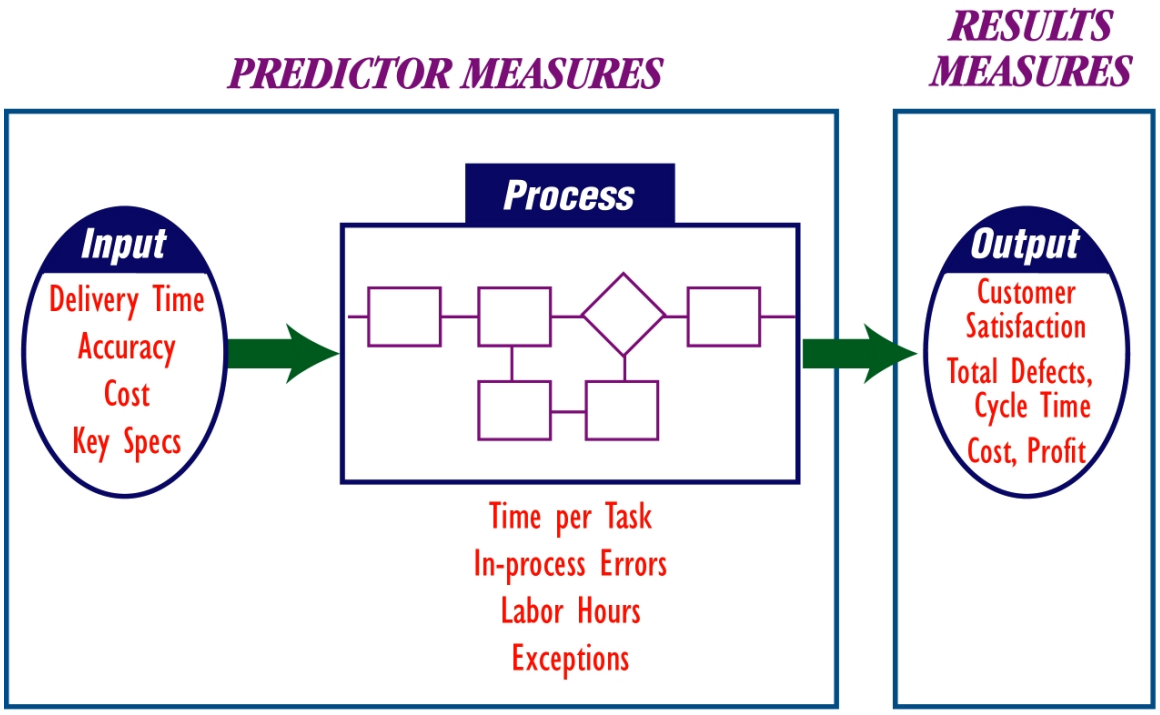
Customer requirements based on careful assessment.

Processes designed & run to fulfill customer requirements.

Multi-faceted, ongoing "Voice of the Customer" effort.

Customer-focused data key to managing the business, short- and long-term

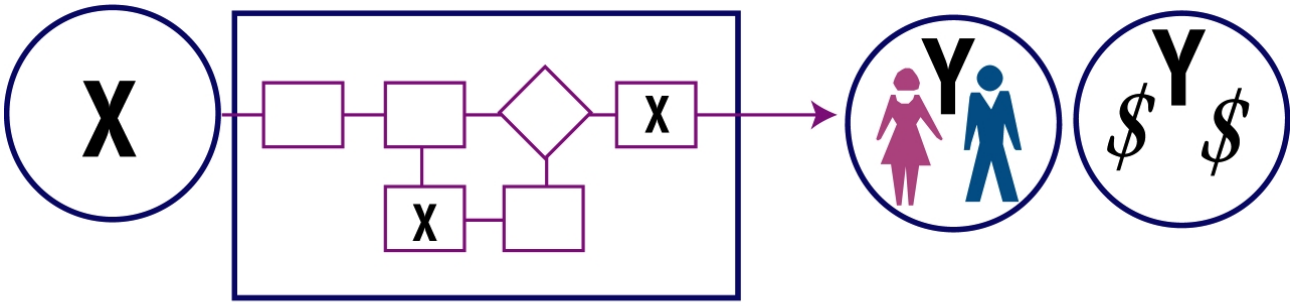
Variation, Processes & Measures



How well do these ...

... predict these?

Linking Business Variables



$$Y = f(X_1, X_2, X_3 \ldots)$$

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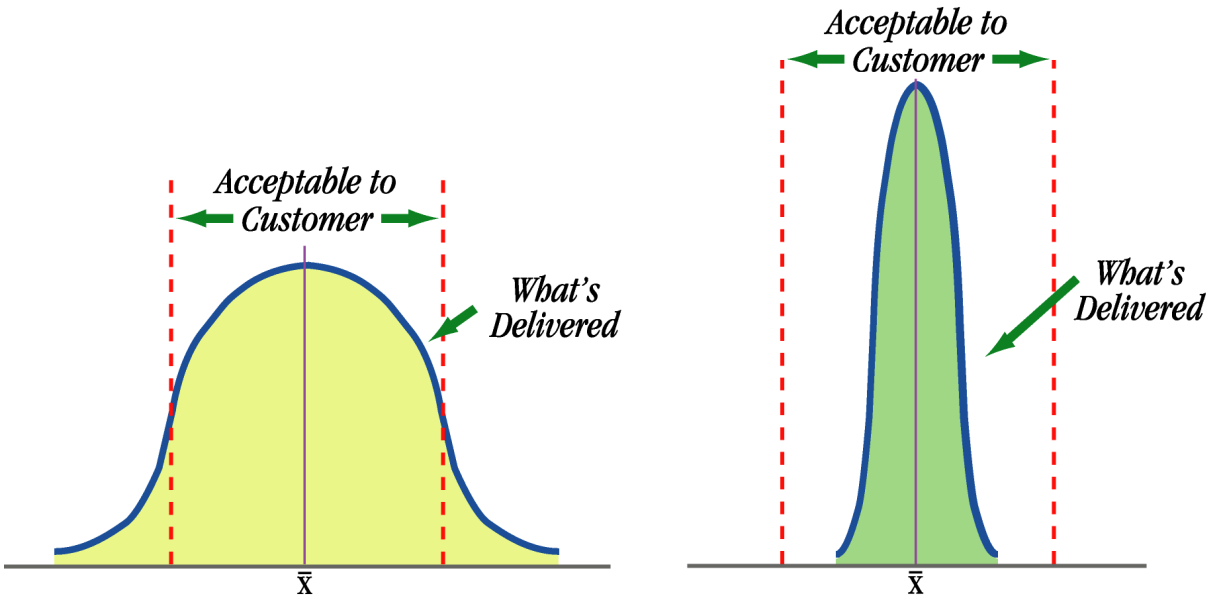
Variation & Six Sigma

Key Principles

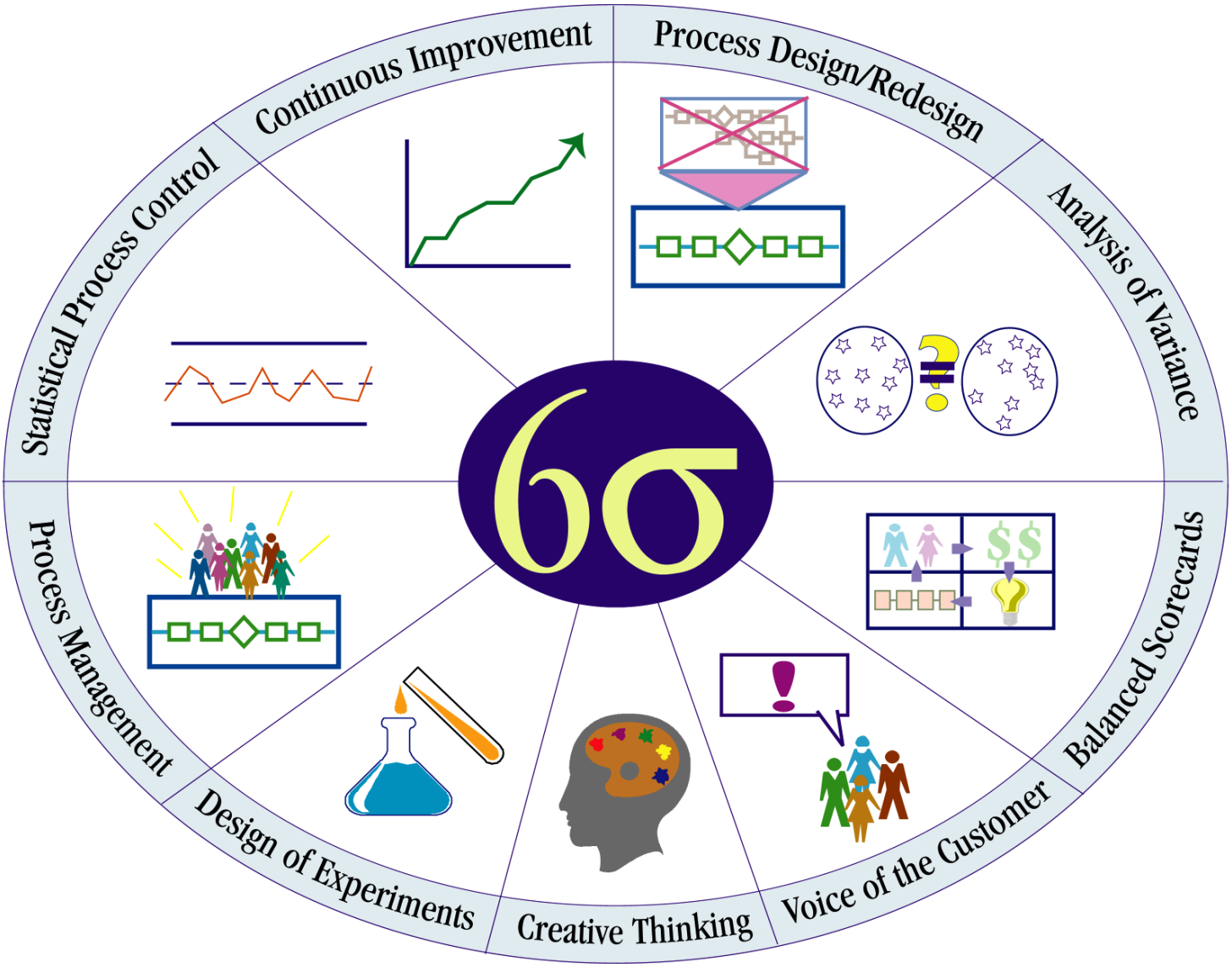
- **All processes vary**
- **Various causes, including changes in:**
  - People
  - Equipment/Materials
  - Information
  - Processes/procedures
  - Environment
- **Too much variation = trouble**
- **We can *learn* from variation ...**

Customers, Defects & Variation

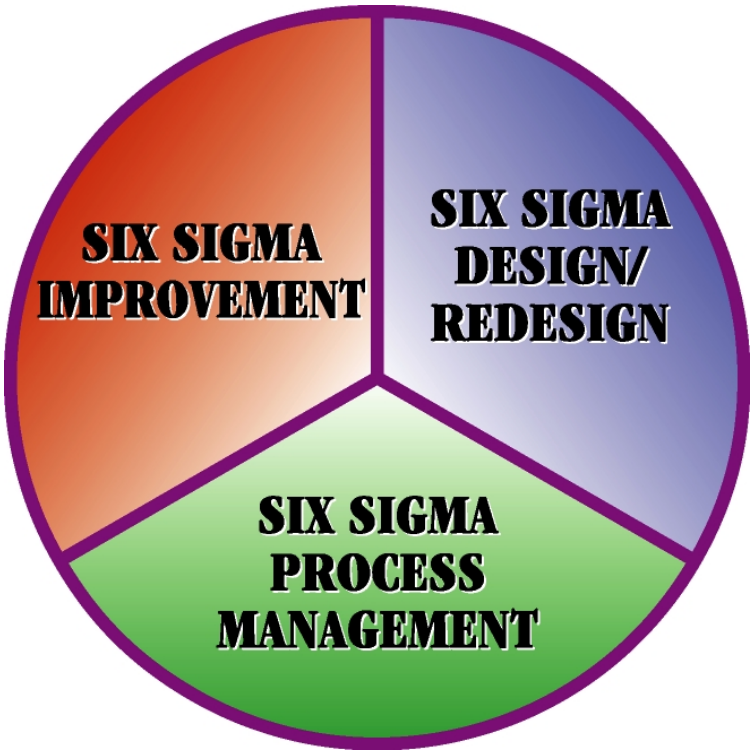
Relating Real Performance to CTQs



Selected Six Sigma Methods & Tools



Six Sigma Strategies



Six Sigma Improvement

- Target areas of high defects, cost, pain
- Apply focused solutions
- Reduce areas of significant variation

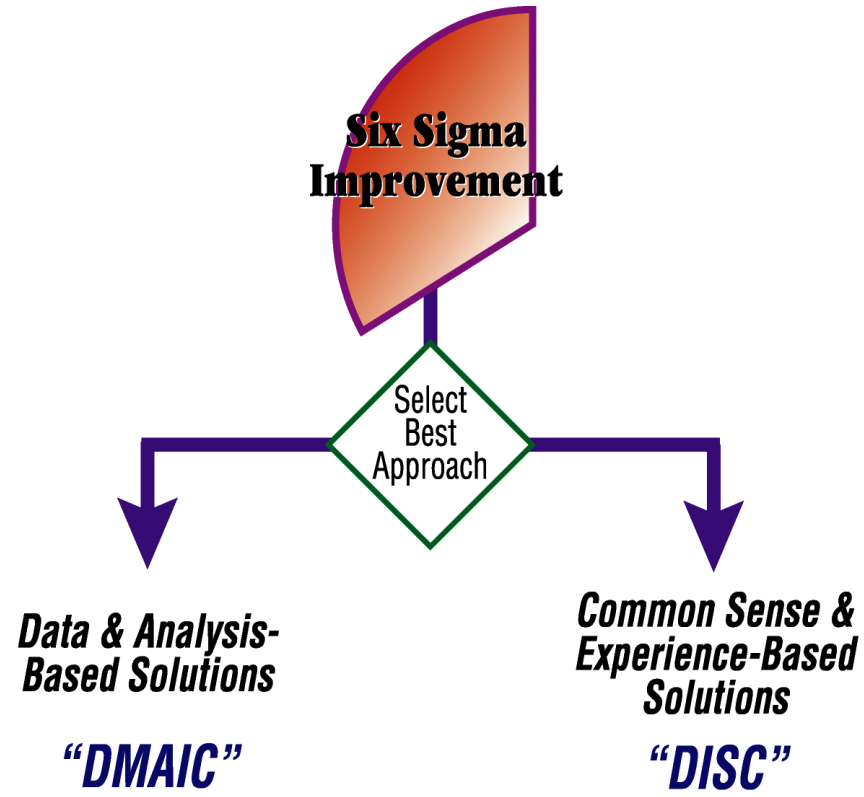
Six Sigma Process Management

- Develop process knowledge & infrastructure
- Streamline links between customers, process & people
- Create end-to-end ownership & alignment
- Ensure measures & monitoring for rapid response

Six Sigma Design

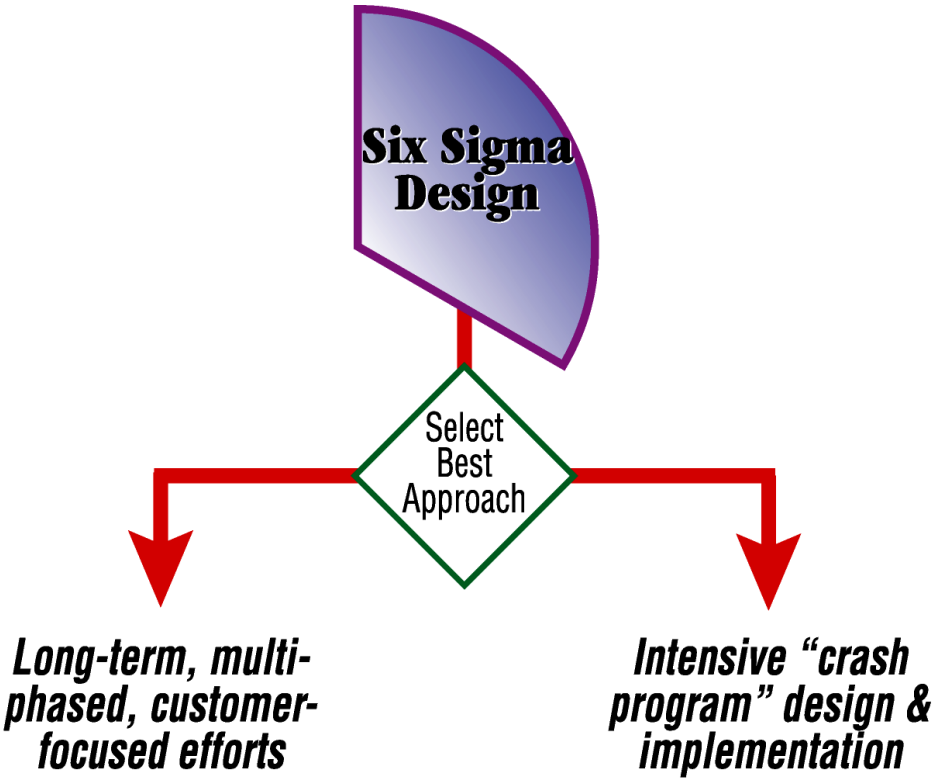
- Take advantage of new customer needs
- Incorporate new technologies & core competencies
- Integrate acquisitions & reorganizations
- Reduce costs, time, rework, frustration
- Make a clean break with old, tired ways

Improvement Options



Both the Improvement and Design strategies can be tackled using a more thorough, and usually more effective approach—*or* an accelerated, short-cut approach.

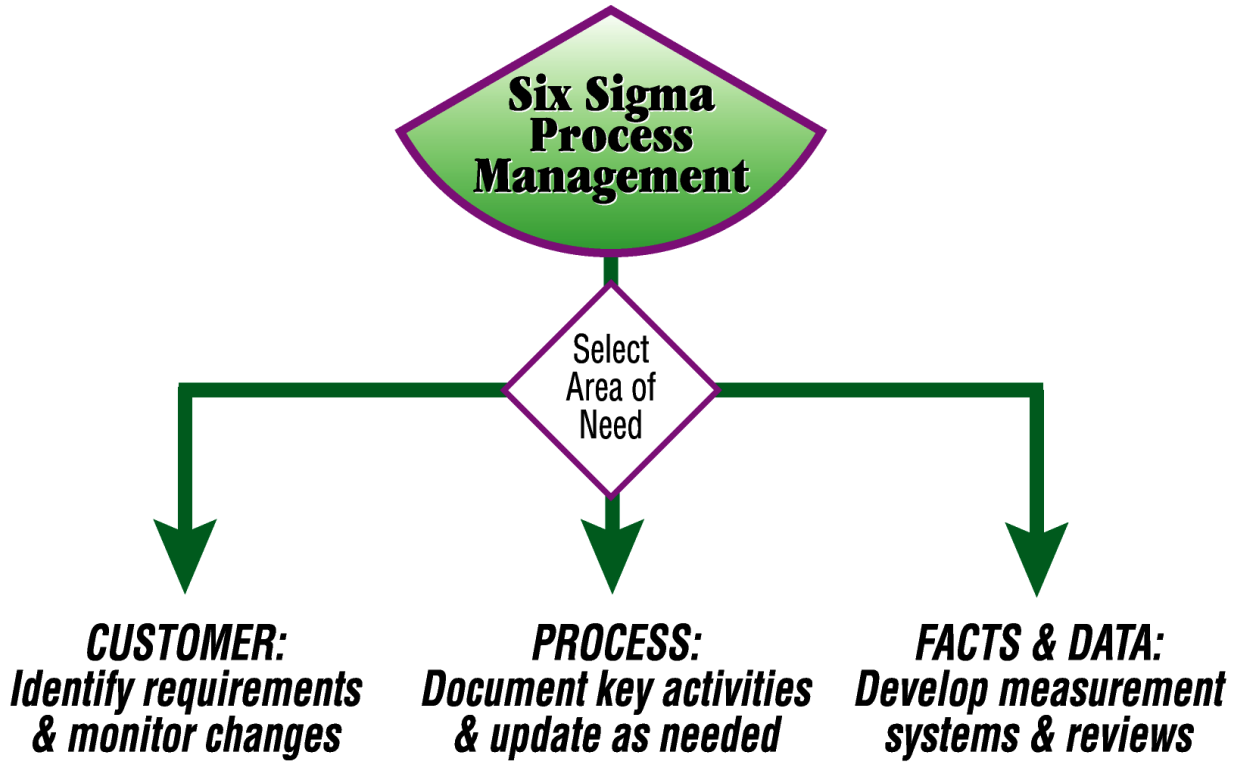
Design Options



This diagram shows the choice of approach for a possible design project. A "crash" design process would often be used to accommodate a merger or to address a need for deep, rapid change.

Whether Improvement or Design, the "short-cut" approaches can have some risks and disadvantages—but they are options to consider when the time and/or scale of change is more limited.

Process Management Elements



Six Sigma is as much about *managing* processes as it is about *improving* them. Having solid customer, process and data knowledge is key to knowing what and when to take action—and to sustaining the gains from any type of improvement project.

Combining Six Sigma Strategies

Without Six Sigma

Six Sigma Improvement —without Mgmt System

Six Sigma Improvement Only—with Mgmt System

Six Sigma Improvement, Design/Redesign & Mgmt

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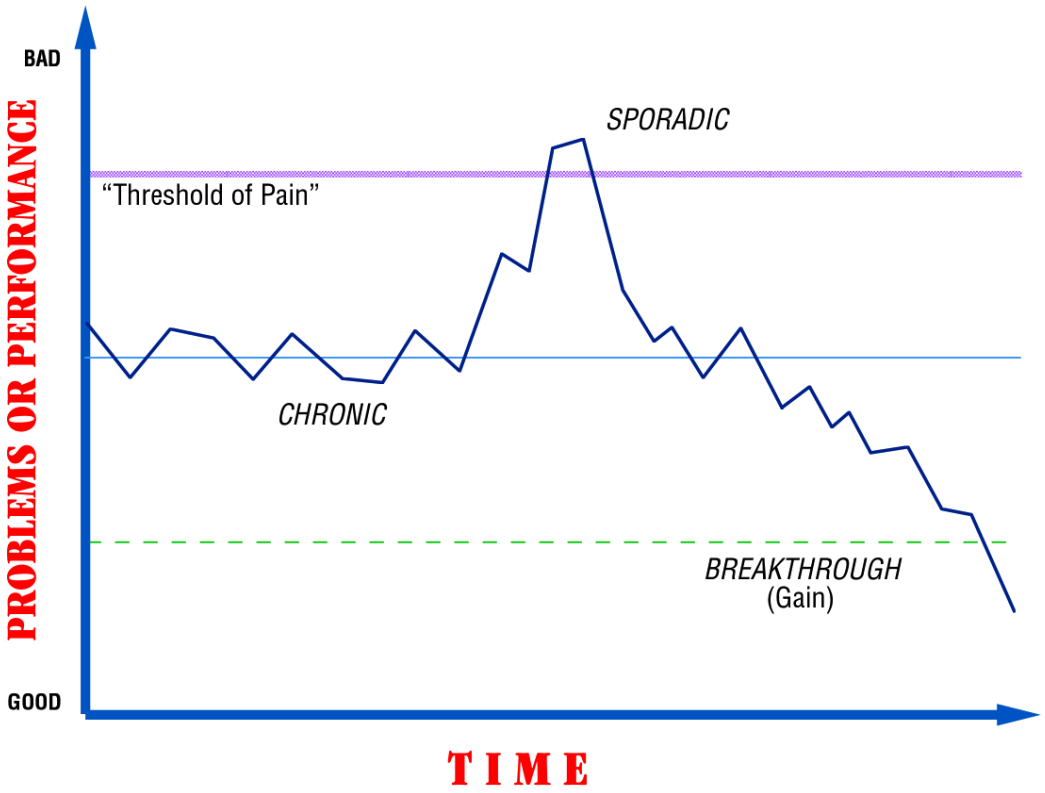
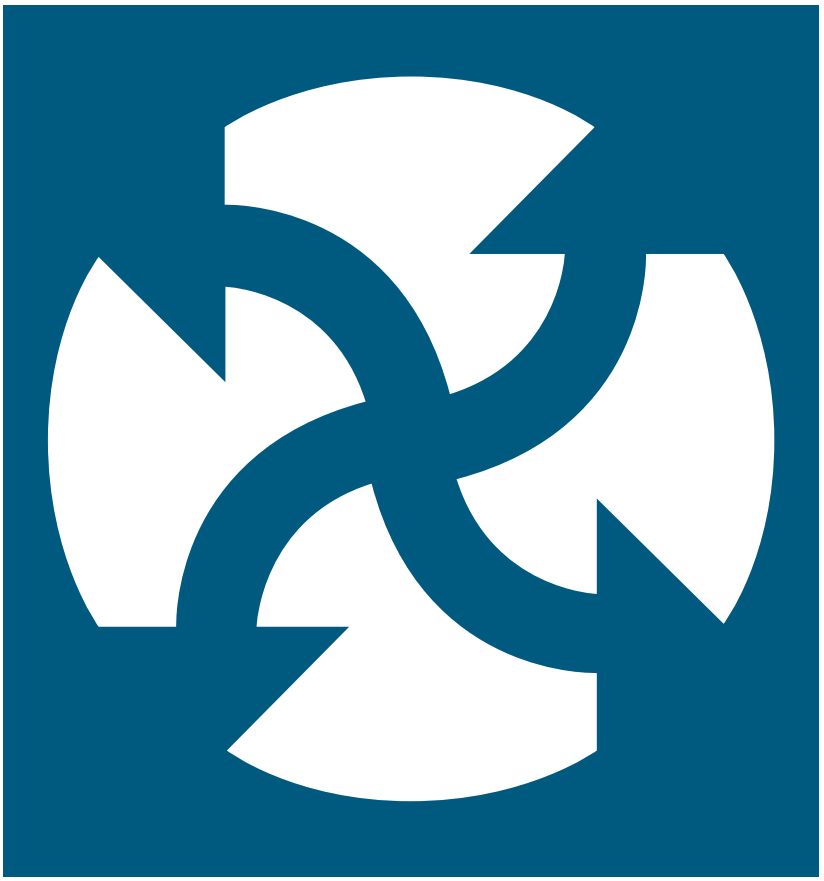
Threshold of Pain



Company & Project Profiles



Who's Using Six Sigma?

- GE
- Motorola
- Allied Signal
- American Express
- DuPont
- Vanguard
- McKesson
- Bombardier
- Sears
- Starwood Hotels
- JP Morgan
- Kodak
- Seagate
- Johnson & Johnson
- Fidelity
- Sony
- Sun Microsystems
- Ford

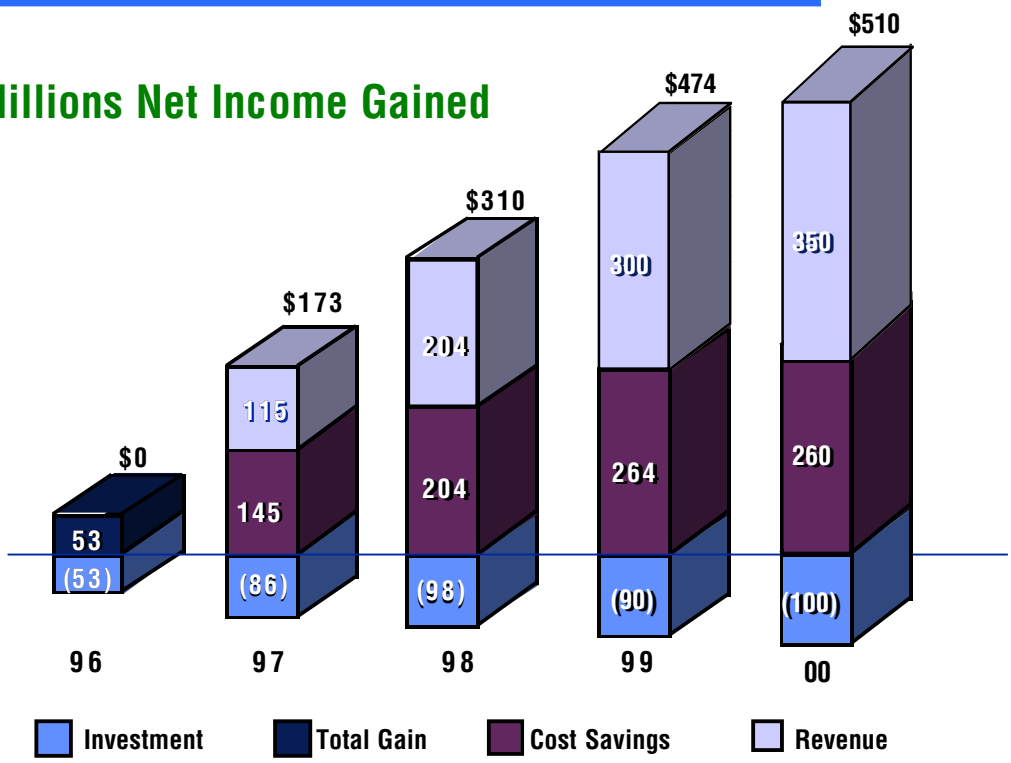
GE Capital Services

Pioneer in Service Six Sigma

- **Effort begun early 1996**
- **Extensive training**
  - Champions, Teams, Black Belts, Green Belts, Process Owners, Sales Green Belts
- **Concepts adapted to a non-technical environment**
  - E.g. Two-week core BB training, one week team & change management
- **Projects selected by "Quality Council" for each business**

GE Capital

GE Capital: Net Income Results



Cendant Mortgage

- **Fast-growing, entrepreneurial mortgage company** (HQ-Mt. Laurel, NJ)
- **Sustained, Leader-Guided Effort:**
  - Senior Leadership Planning- formed "Cendant Mgmt System"
  - Trained 50+ Black Belts
  - Team Player training—management development
  - Formal and informal projects
- **Results:**
  - Reduced chaos; data-based decisions; process focus
  - Projects yield $ 3.6 million first year
  - Executive reorganization to fit process flow
  - Expanding in 2001 to Real Estate, Relocation, Hotels

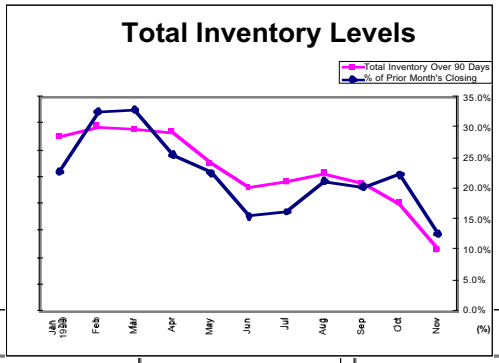
Strong Buy-in at Cendant

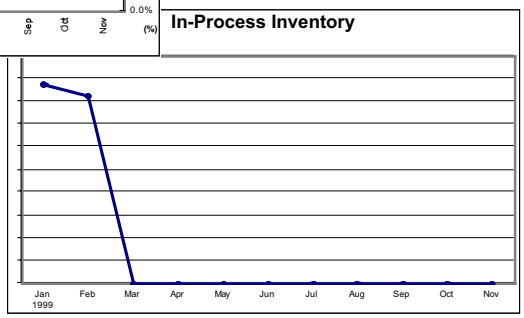
"I've been seeing the positive effect it's having and want to learn about it, too."

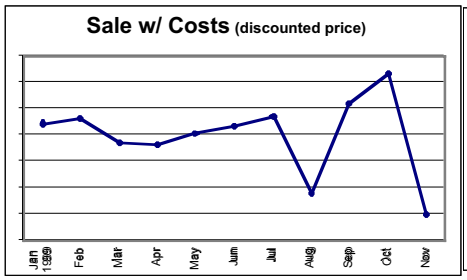
"These are skills we can go ahead and use every day."

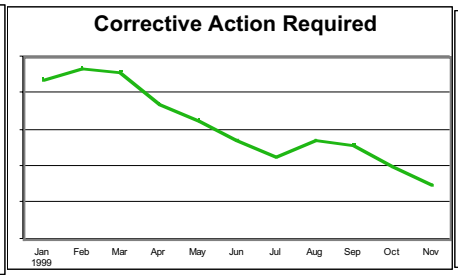
"The stuff we're learning here is critical to the company's continued success"

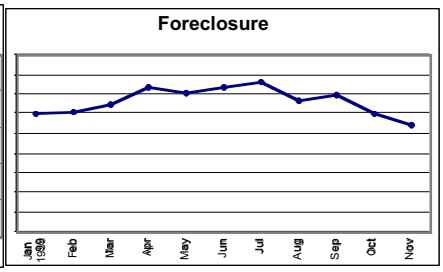
Process Dashboard











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Sears Product Repair Services

- **Largest home appliance repair business in U.S.** (15,000 repair techs)
- **Challenges: Build customer satisfaction, gain market share, reduce costs**
- **Top management and field leadership launching & guiding the effort:**
  - Train Business Leadership Team and Regional/District Mgmt.
  - Joint project /Black Belt selection
  - Teams engaging all key groups
  - Quality VP named head of line organization

Sears Product Repair Services

Results to-date:

- **Integration of field & Home Office improvements**
- **Current piloting of initial wave project solutions: more than $2 million anticipated gains/savings**
- **Initiating process management effort**
- **Expanded to Logistics, Customer Care (call center) & Credit**

Benefits for the Bottom-Line

What Results to Seek from Six Sigma Efforts?

- **Increase understanding of customers**
  - Drivers of satisfaction, loyalty, behavior, market share
  - How are we doing? How can we stay ahead of competitors?
- **Increase effectiveness**
  - Consistently meet customer requirements
  - Reduce variation, eliminate defects & create delight
- **Enhance efficiency**
  - Cut costs due to errors, rework
  - Streamline processes; Maximize use of resources & money
- **Transform Management**
  - More informed decisions, greater collaboration & focus
  - Optimize flow of value to customer—& gains to shareholders

Cost savings are typically the most immediate benefit of Six Sigma efforts—but a sustained effort can reap much more impressive rewards.

In fact, increasing *revenue* through better products, services and processes has potentially unlimited benefit. Cost cutting will always have limits.

How is Six Sigma DIFFERENT?

Key Points Summary …

- **Integrates improvement strategies & tools into a *management system***
- **Demands near-term, valid gains balanced with long-term competitive improvement**
- **Driven by leaders, owned by everyone**
- **Builds on past improvement initiatives**
- **Devotes essential time & resources to drive change**
- **A dynamic process, not a fixed plan**

Customer-Centric!

SIX SIGMA LEADERSHIP

How to Begin the Six Sigma Initiative

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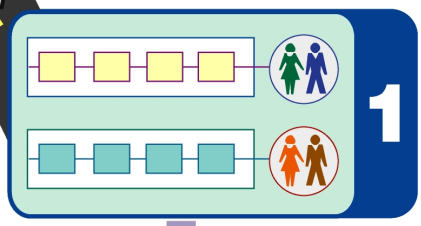
Business Transformation

OPTIONS:

- Limit scope to 1 or 2 core processes
- Concurrently select strategic &/or problem solving projects



IDENTIFY CORE PROCESSES & KEY CUSTOMERS

Strategic Improvement

OPTIONS:

- Identify strategic issues that reflect broader transformation challenges
- Limit scope to key customers (e.g. new markets, most profitable buyers, etc.)
- Concurrently launch problem solving projects tied to strategic intiative

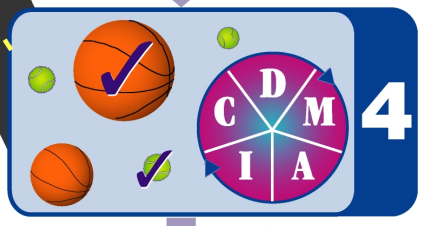
DEFINE CUSTOMER REQUIREMENTS

MEASURE CURRENT PERFORMANCE

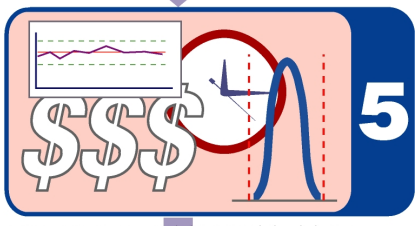
Problem Solving

OPTION:

- Concurrently launch effort to define core processes & key customers



PRIORITIZE, ANALYZE & IMPLEMENT IMPROVEMENTS



EXPAND & INTEGRATE THE SIX SIGMA SYSTEM

Steps to Six Sigma: Overview

The Roadmap describes an ideal, full-scale implementation. Options or "short-cuts" will be reviewed during the workshop

Identify Core Processes & Key Customers

"Core" processes are those that provide critical products/services to external customers. By starting with an inventory of essential value-adding activities, organization leaders can focus on identifying issues and improvements systematically, as opposed to targeting efforts based on purely functional needs or the "squeaky wheel." Process ownership can also be defined.

Key Deliverable: A process-based model for the entire organization, including important functional interfaces, key value-focused products/services, and major customer groups.

Define Customer Requirements

As an executive of a Six Sigma-focused company said: "Too often, we really don't understand what our customers want." This step involves in-depth probing and clarifying of *specific* and *measurable* requirements for core products/services based on direct customer input. This effort is essential to ensuring accurate Sigma measures—not to mention achieving maximum customer satisfaction and Six Sigma performance.

Key Deliverable: Clearly-defined requirements (aka CTQs for "Critical to Quality") for core products/services based on real customer input (not what we *think* customers want/need). Service requirements—i.e. essentials for how we interact with customers—are also useful.

Measure Current Performance

Once specific, validated requirements are identified, process performance can be measured accurately. In an ideal case, owners of each core process take responsibility to gathering data on the effectiveness of their efforts in meeting all customer requirements. Using Sigma measures, the performance of different processes can be compared and major areas of deficiency identified.

Key Deliverable: An effective process performance measurement system—including data gathering guidelines and procedures for adjusting measures as customer needs change. Measures are translated into Sigma values for comparison to Six Sigma goal.

Steps to Six Sigma: Overview

Prioritize, Analyze & Implement Improvements

The pay-off for well-planned Six Sigma initiatives comes in making changes that boost process performance, add value, reduce costs, integrate new technology and ideas, etc. Six Sigma improvement includes focused problem solving (aka "continuous improvement") as well as process/product design or redesign (aka "reengineering" or "design for Six Sigma"). This phase contrasts with other quality approaches in the breadth of possible techniques and tools applied to achieving and sustaining results. Completing the three prior phases typically makes this effort more focused and reduces the cycle time to complete improvements.

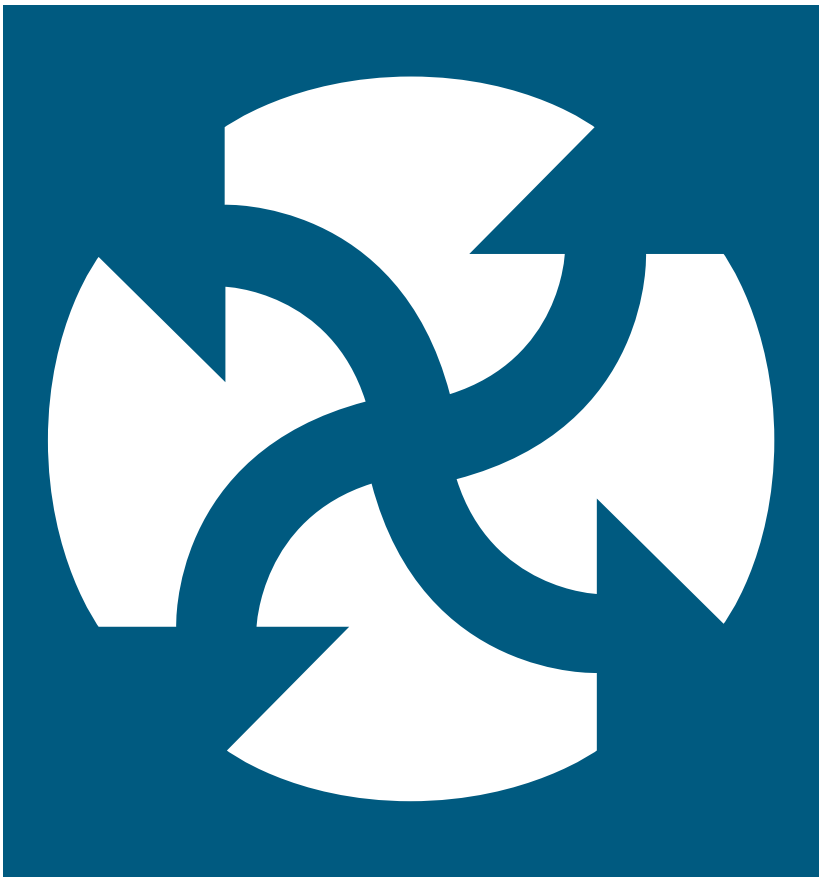
Key Deliverable: Focused efforts/solutions to boost Sigma performance, concentrated on opportunities that are *meaningful* to customers and business success, and *manageable* as an organization/process change.

Expand & Integrate the System

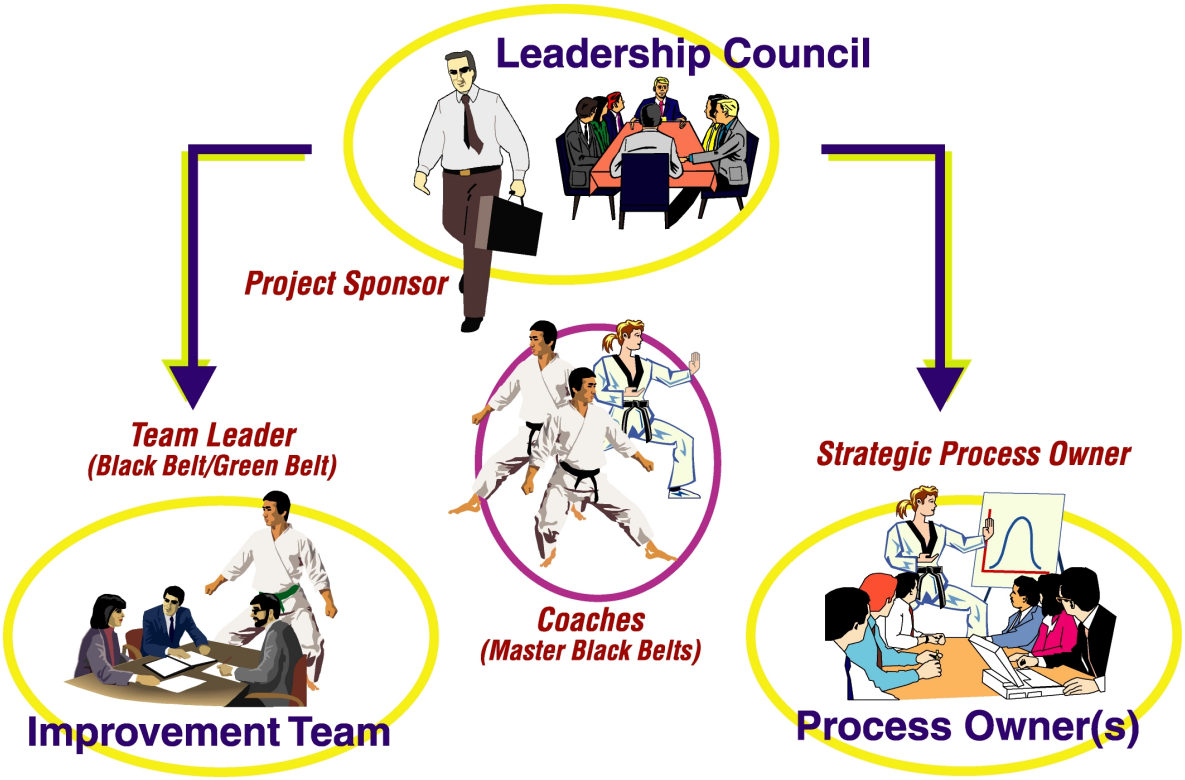
In the organization that is truly adopting a Six Sigma way of business, the activities that begin in earlier phases of the Roadmap continue. These include use of ongoing process measures, "voice of the customer" feedback, improvement and redesign of processes as need/opportunity arises, and a system of cross-functional process ownership. The change to a "Six Sigma" environment can also involve more subtle—but perhaps more important—changes. For example, a Director at Allied Signal describes an "attitude change" in his organization, in which people pose questions, define problems and conduct meetings in a much stronger spirit of objectivity and collaboration.

Key Deliverable: An ongoing system for maintaining high-level process performance and efficiency, coupled with a proactive approach to managing work, cross-functional collaboration and continual focus on meeting current and developing customer needs.

Structure, Roles & Responsibilities



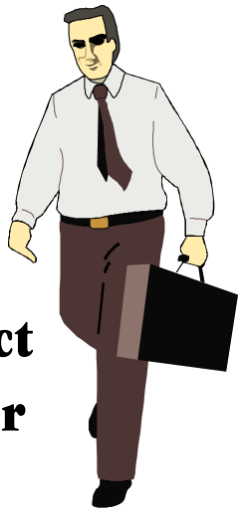
Model Six Sigma Structure



Leadership Responsibilities

- **Establish vision & guide implementation**
- **Select Process Owners, key contributors**
  - Team Leaders & Coaches
  - Resources for measurement, planning, training
- **Identify/choose projects**
- **Serve as & support Sponsors**
  - Select & charter teams, review results
  - Identify and remove barriers for the teams
- **Communicate & lead organization change**
  - Using communication; team/department meetings
  - Cross-functional team formations

Sponsor/Champion Responsibilities



- **Primary representative of team on Leadership Council**
- **Provide/negotiate resources for project**
- **Help set/maintain scope & direction for improvement or design**
  - ... and approves changes if necessary
- **Negotiate issues & overlaps between teams**
- **Work with Process Owner to ensure handoff after project**

Champion Selection Criteria

Project Sponsors should have the following attributes:

- **Able to help Black Belts and teams navigate organizational "politics"**
- **Knowledgeable of business strategic objectives & priorities**
- **Respected & capable of gaining support for the project**
- **Willing to *guide* the team and let them form their own decisions (even when they may disagree)**
- **Good "team player" with other leaders**

Team Leader Responsibilities

"Black Belt" or "Green Belt"

- **Guide improvement/design project to successful completion**
- **Maintain communication with project Sponsor/Champion**
  - Maintain alignment with business needs, priorities
- **Provide documentation of team efforts**
  - Progress reports
  - Storyboard
- **Ensure hand-off to Process Owner**

DMAIC Team Selection Criteria

Team members should have the following attributes:

- **Experience and skills specifically related to the process in question**
- **Broadly represent all areas of the process and the organization**
- **"Upstream" representation of processes that may contain root causes**
- **Experience and skills that lend to the understanding and application of the DMAIC process**

All team members need not have all of the same strengths! It may even be good to have one person on the team without specific process knowledge to provide a "fresh set of eyes".

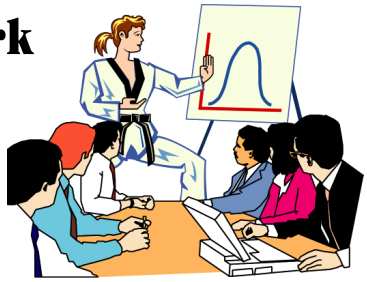
Be sure to keep team size manageable! It is typically recommended that the core team have between four and six members.

DMAIC Team Leader Criteria

Team leaders should have the following attributes:

- **Strong understanding of the business process in question**
- **Recognized leadership ability to both *lead* the team and *influence* implementation**
- **Potential to apply advanced DMAIC tools and concepts**
- **Potential for promotion to VP or similar level in the future**

Process Owner Responsibilities



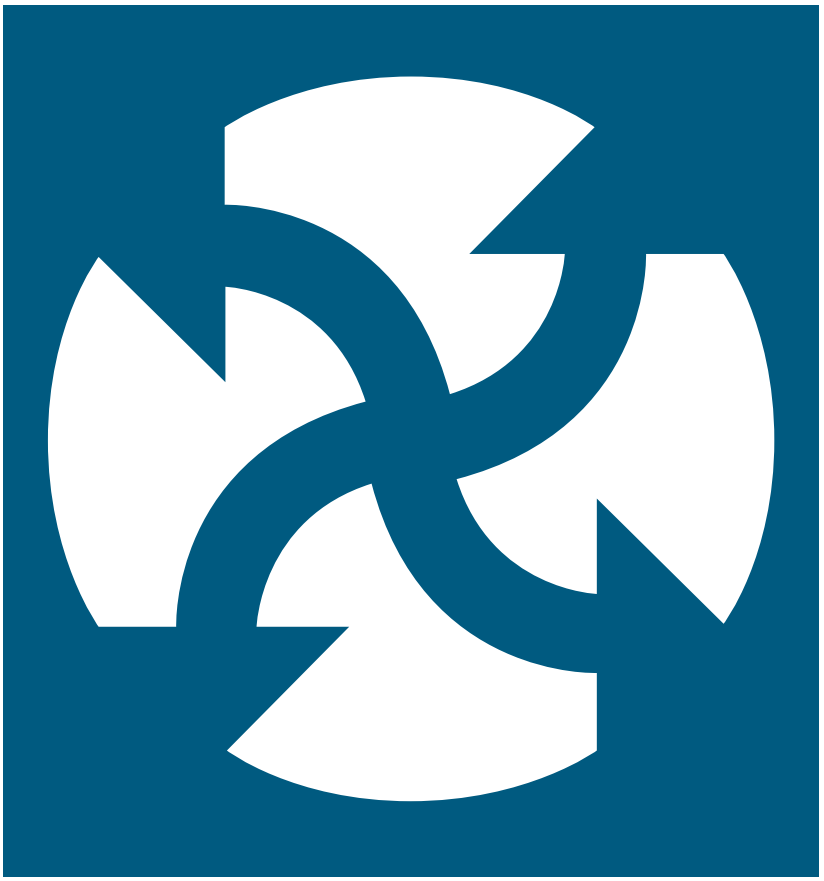
- **Define & communicate flow of work**
  - Validated by people doing the work
- **Ensure effective measurement & monitoring of activities**
  - Results & Predictors
- **Coordinate across functions & manage interfaces with other processes**
- **Identify problems/opportunities as they arise— "own" project selection long-term**
- **Accept responsibility to maintain gains from improvement projects**

Coach Responsibilities

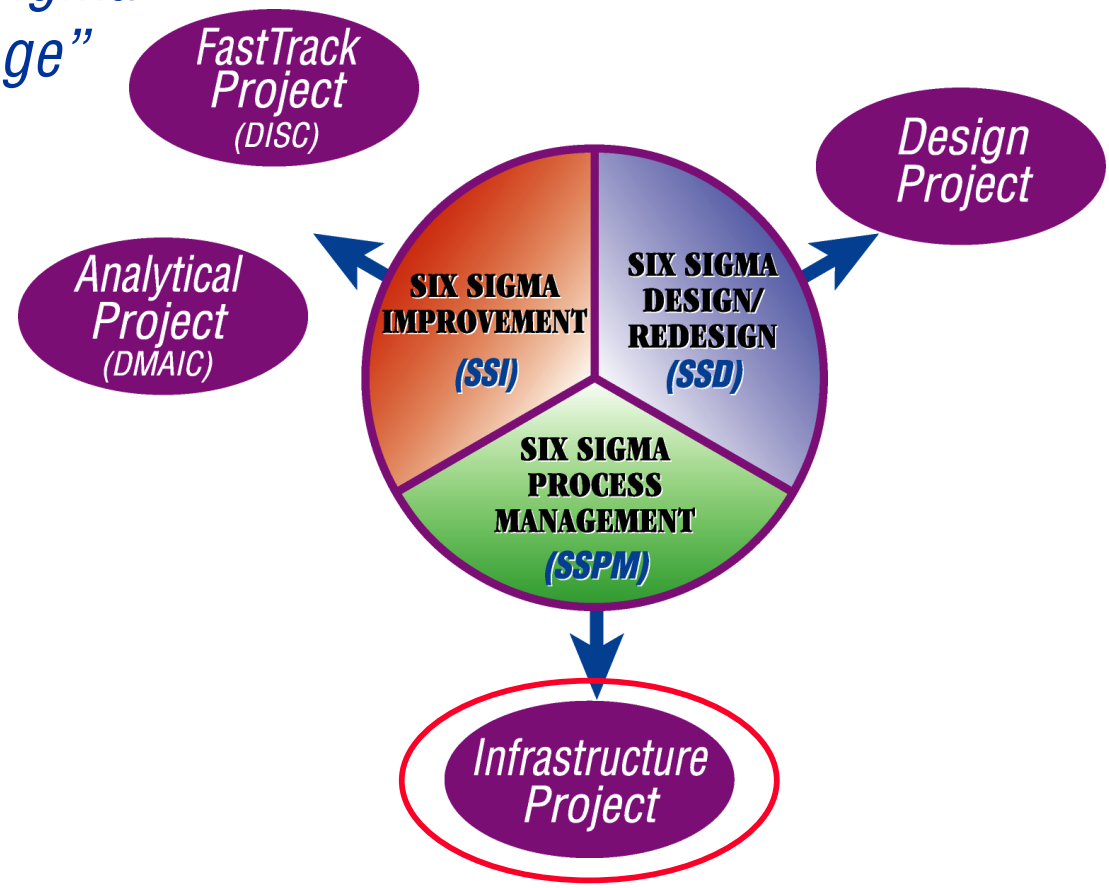
"Master Black Belt"

- **Advanced expertise in improvement methods**
  - Ideally, organization change AND technology
- **Day-to-day guidance for Team Leaders**
- **Execute measurement & detailed analysis**
- **Support benchmarking, special tasks (e.g. changes in IT)**

Building the Foundation for Six Sigma Management



Six Sigma "Triage"



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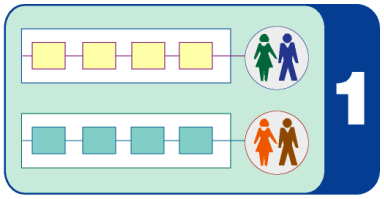
Core Process Definition

What:

Identification of the primary drivers of value, satisfaction —& profit

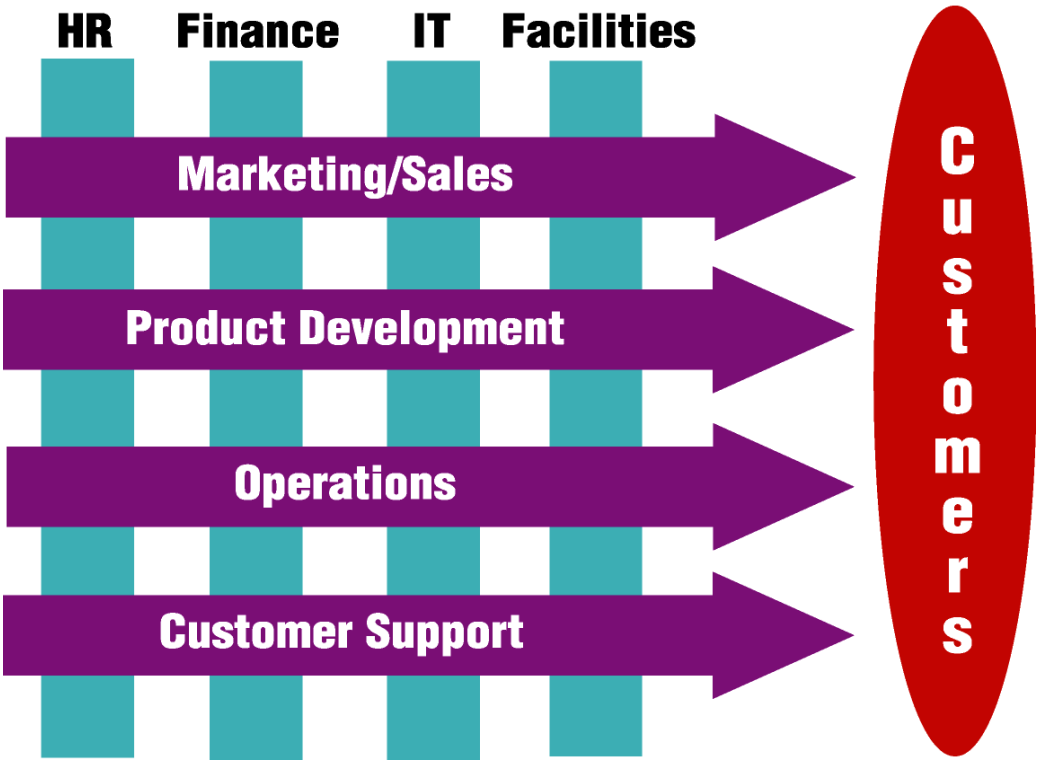


IDENTIFY CORE PROCESSES & KEY CUSTOMERS

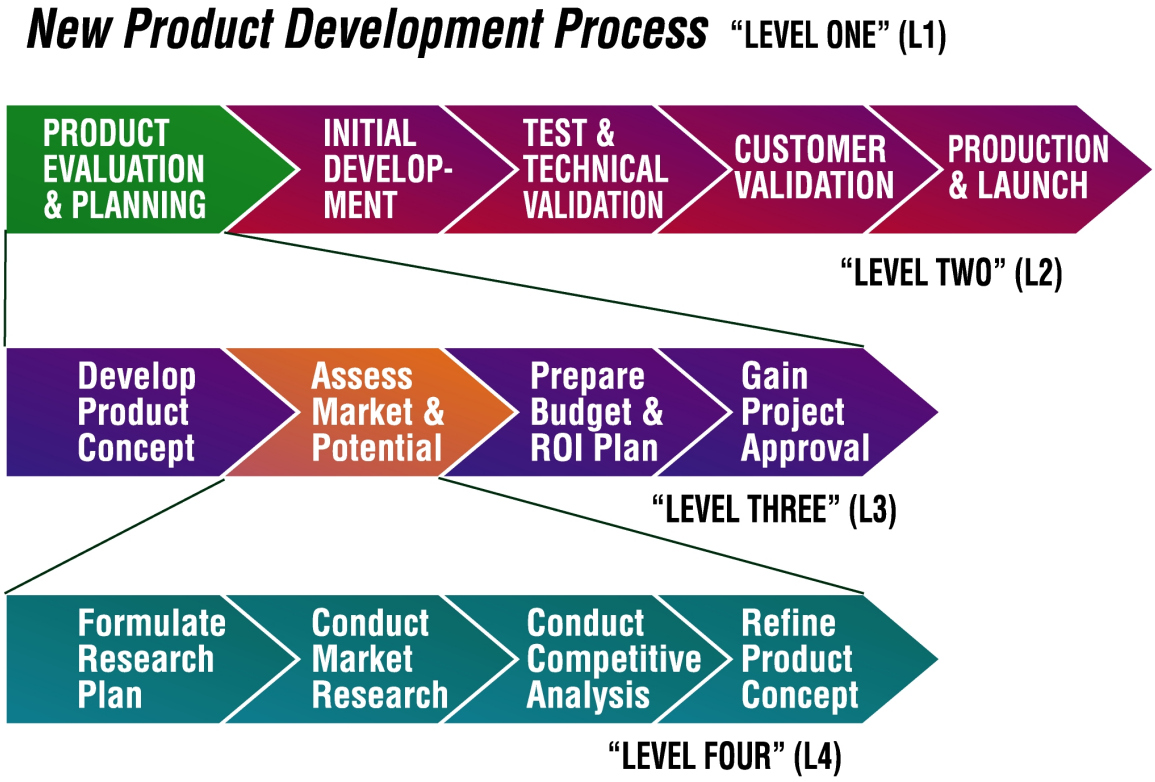
Why:

- **Focus on essential processes**
- **Establish process inventory & understanding**
- **Develop ownership, monitoring & collaboration**
- **Prepare for defining customer requirements**

Core & Enabling Relationships



Levels of a Process



A SIPOC (or its cousin, the "Chevron Diagram," shown above) can be created for processes at different degrees of detail.

Process "levels" can be helpful in determining where you are or what level of detail is needed:

Level One: A core or major enabling process

Level Two: Key steps or subprocesses of a core process

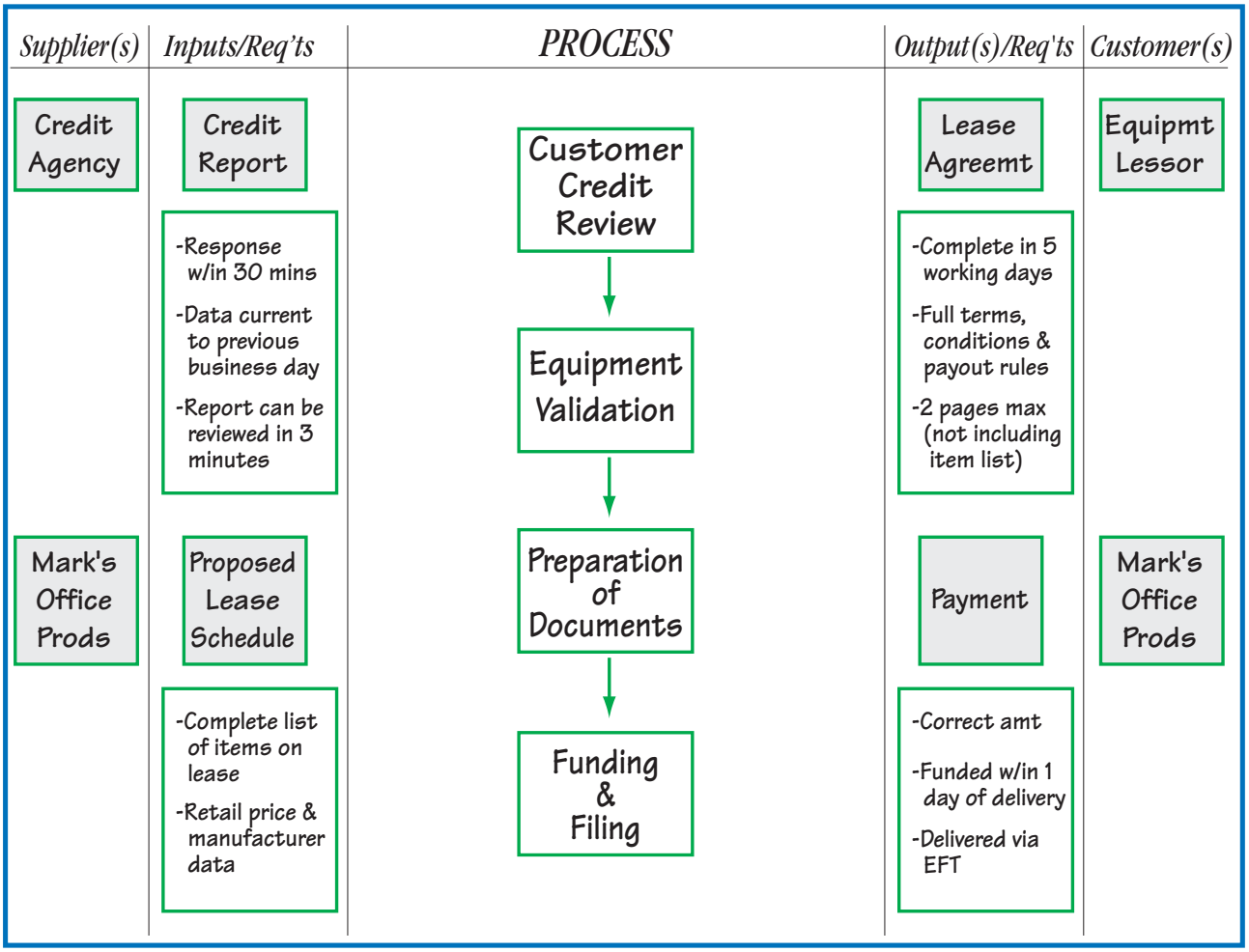
Level Three: Main activities of a subprocess

The SIPOC Diagram

"Bird's-eye view" of a process:

- **Clearly defines boundaries/scope**
- **Identifies *major* outcomes & activities**
- **Avoids over-detail, confusion**
- **Helps plan & target measurement**
- **Focuses cross-functional alignment & analysis**

Equipment Leasing Process: SIPOC Diagram



This sample SIPOC diagram shows all the elements of this valuable tool. Note that it also includes *Requirements* for each of the Outputs.

ACTIVITY: Core Processes

1. **As a full group, we'll develop a draft list of "core" processes**
2. **Be ready to share & discuss:**
   - How well are processes identified & managed "end-to-end?"
   - How well & consistently are these activities measured?
   - What type of Voice of the Customer data drives the processes?

Steps to Diagram SIPOC

1. **Identify the Process to be diagrammed & name it**
   - Write at top-center of diagram
2. **Define the "Scope":**
   - Customer(s) and key Output(s)
   - Supplier(s) and key Input(s)
3. **Clarify the Requirements** [optional, but recommended]
   - What are key features/characteristics of the Output for each Customer?
   - What are key features or characteristics of the Input for the Process?
4. **Establish high level process steps**
   a. Brainstorm major process activities on "sticky notes"
   b. Group or organize activities into similar categories or "major steps" in the process {Suggestion: use "Affinity" method}
   c. Place major steps in most appropriate order ("block diagram" as shown)

Helpful Hints:

In a team setting, start by posting blank flipchart pages to give you room to develop the entire SIPOC diagram. Use "Stickies" for each element to you can more easily edit your work.

It's usually best to develop the SIPOC diagram starting at the ends and working *in*: identify the "O-C" and "S-I" components before developing the high-level process diagram.

Including Requirements is optional; however, including a few key requirements for each Output can help ensure you stay focused on the customer.

Voice of Customer Strategy

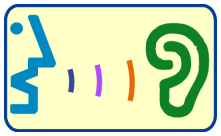
What:

Clarify critical features or specifications that satisfy —and delight—customers

Why:

- **Gain enlightenment on customer needs**
- **Develop performance goals & standards**
- **Create meaningful measures**
- **Establish "listening" methods & processes**

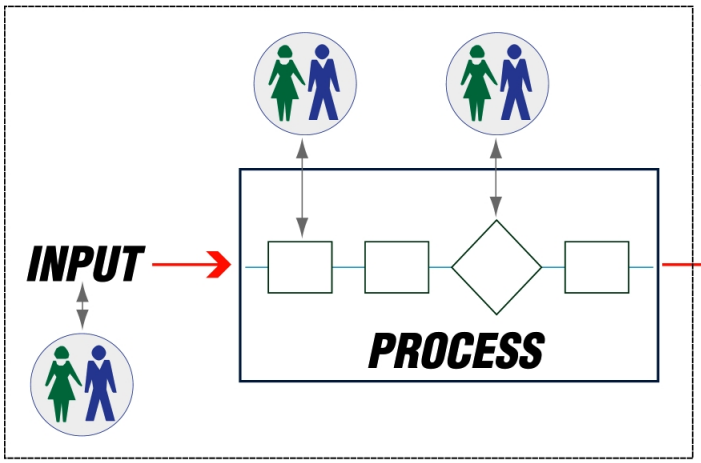
Voice of the Customer (VOC)



Strategic Emphasis on Customer Knowledge

- **Attention & resources to "active listening"**
  - A balanced set of tools & processes to listen and learn
- **Translating qualitative & quantitative data into verifiable requirements**
- **Prioritizing Output & Service requirements**
- **Prioritizing & implementing process performance standards from customer data**
- **Establishing ongoing effort to gauge performance, track/anticipate change**
  - *Using* Customer data to stay "ahead of the curve"!

Output vs. Service Requirements



Output Requirements:

What features or characteristics of our "final" product or service are key to customer satisfaction?

Service Requirements:

What are standards for how we interact with & treat customers?

= customers

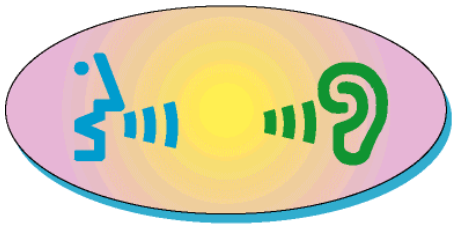
VOC Research Methods

Direct

- **Surveys**
- **Focus Groups**
- **Interviews**
  - Phone
  - Face-to-face

Indirect

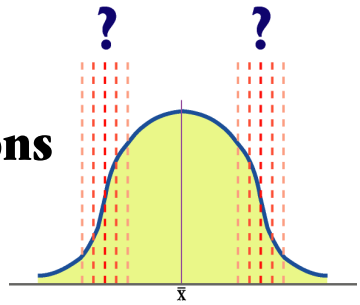
- **Competitor/market analysis**
- **Behavior measures**
- **Complaints***
- **On-site observation***



*may be direct

Defining Requirements

Guidelines



- **Link to Customer needs & expectations**
- **State clearly & simply**
- **Express in the positive**
  - What you'll DO, not what you will NOT do
- **Be specific, unambiguous, measurable**
  - "Respond by noon of following day" not "Respond quickly"
- **One item at a time**
- **Describe the standard to be met—not *how* you'll meet it (service requirements excepted)**

Critiquing Requirements

1) Invoices to be completed and mailed to customers by 5:00pm on the 15th of each month.

2) Everything must be shipped as soon as possible.

3) No, errors, no how, no way!

4) Credit reports are due back from the agency within 1 hour from the request.

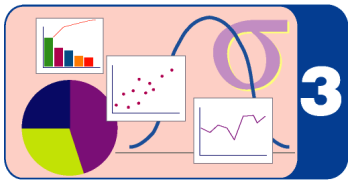
5) Easy and convenient customer service center supported by newly hired representatives, to answer phones at all times.

6) Total cycle time for responding to e-mail questions, to take 24 hours or less.

Measurement Systems

What:

Establish baseline process performance indicators



MEASURE CURRENT PERFORMANCE

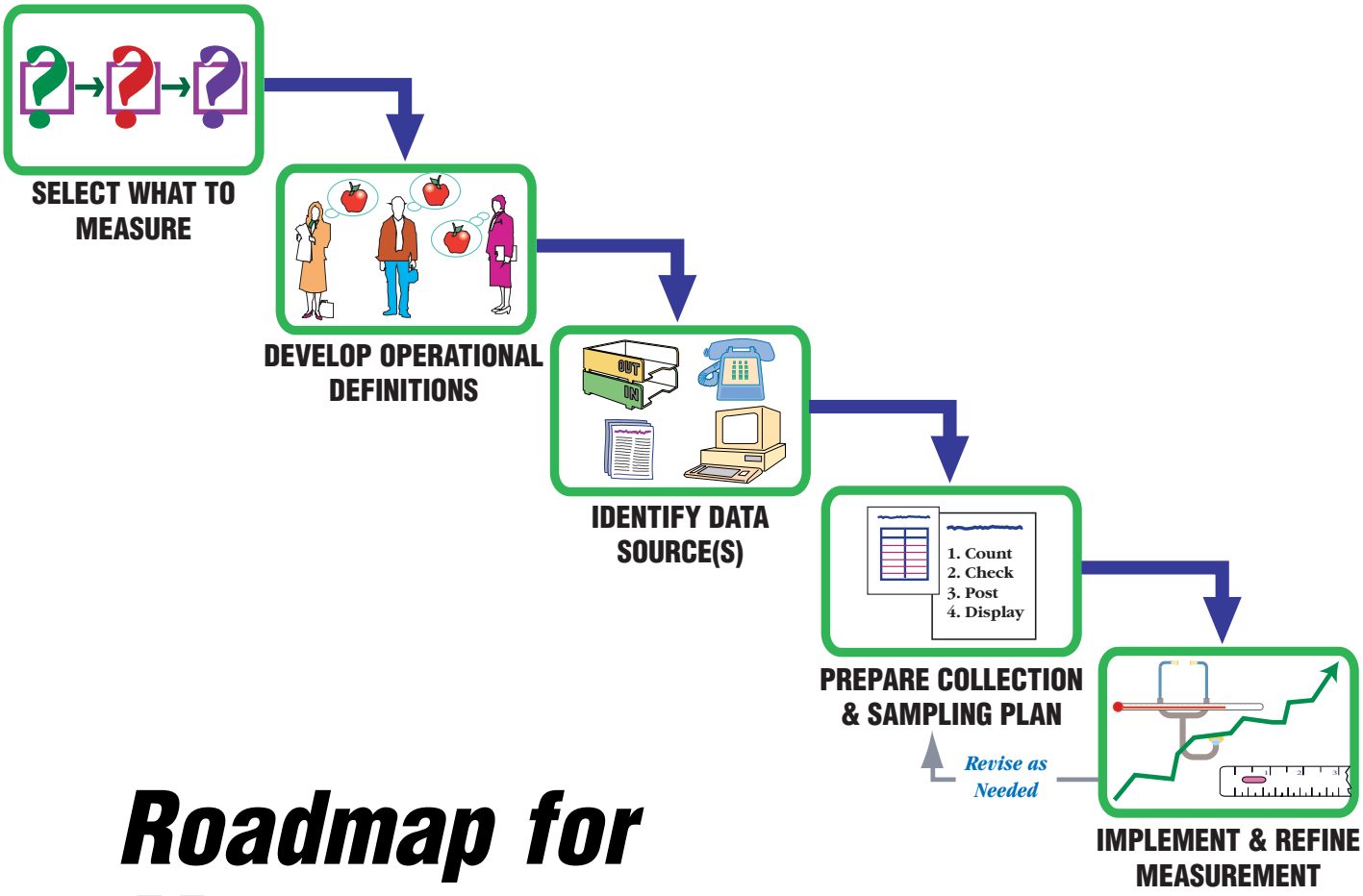
Why:

- **Gauge effectiveness of key processes**
- **Evaluate internal efficiency of processes**
- **Understand variation in the process**
- **Gain solid data for project selection**

ACTIVITY: Identifying Key Measures

Work on "core processes" defined earlier

1. **Make a list of *existing* measures for the process**
   - Are they Output (Y) or Input/Process (X) measures?
2. **List *additional* measures that may be useful in managing the process**
   - Balance Ys and Xs!



Roadmap for Measurement

Defect Measures

Starting Point for Sigma Measures—& Improvement

- **"Unit" - one item of the process throughput or output**
  - *e.g. loan documents, a coffee cup, a check, a phone call*
- **"Defect" - any failure to meet an essential requirement of a customer (internal or external)**
- **"Defective" - any unit with 1 or more defects**
- **"Defect Opportunity" - a type of potential defect on a unit of throughput/output**

Defect Measure Formulas

◆ Proportion Defective:

Fraction of units with defects

$$\frac{\text{Number of Defectives}}{\text{Number of Units}}$$

43 of 250 applications have defects:

$$\frac{43 \text{ defective}}{250 \text{ units}} = .172 \text{ (or 17.2\% Defective)}$$

◆ Final Yield:

Error-free Units

One (1) - Proportion Defective

1 - .172 = .828 (or 82.8% Yield)

Defect Measure Formulas

◆ DPU: Defects per Unit

$$\frac{\text{Number of Defects}}{\text{Number of Units}}$$

$$\frac{\text{52 defects on applications}}{\text{250 applications}} = .21 \text{ DPU}$$

◆ DPO: Defects per Opportunity

$$\frac{\text{Number of Defects}}{\text{Number of Units x Number of Opportunities}}$$

$$\frac{\text{52 defects on applications}}{\text{250 apps x 4 opportunities/app}} = .05 \text{ DPO}$$

◆ DPMO: Defects per Million Opportunities

$$\frac{\text{Number of Defects}}{\text{Number of Units x Number of Opportunities}} \times 1{,}000{,}000$$

$$\frac{\text{52 defects on applications}}{\text{250 apps x 4 opportunities/app}} = .05 \text{ DPO} \times 1{,}000{,}000 = 50{,}000 \text{ DPMO}$$

Figuring Your Sigma ...

About this Worksheet

Sigma levels of a process can be determined several ways. The steps below use the simplest method, based on number of customer-relevant defects at the ***end*** of a process, or "Output" Sigma.

STEP 1: Selecting the Process, Unit & Requirements

➢ Identify the process you want to evaluate: _____ **(process)**

➢ What is the primary "thing" produced by the process? _____ **(unit)**

➢ What are key customer requirements for the unit? _____

_____

_____**(requirements)**

STEP 2: Defining the "Defect" and "Number of Opportunities"

➢ Based on the requirements noted above, list all the possible *types of defects* in a single unit (e.g. late, missing data, wrong size, wrong component, off-center, etc.). Be sure the defects described can be identified ***objectively***._____

_____

_____ **(defects)**

➢ How many types of defect could be found on a ***single*** unit? _____ **(opportunities)***

STEP 3: Gather Data & Calculate DPMO

➢ Collect end-of-process data: _____ **(units counted)** _____**(*total* defects counted)**

➢ Determine Total Opportunities in data gathered:

Units Counted x Opportunities = _____ **(total opportunities)**

➢ Calculate Defects per Million Opportunities:

(# Defects Counted ÷ Total Opportunities) x 10^6 = _____ **(DPMO)**

STEP 4: Convert DPMO to Output Sigma

➢ Use Sigma conversion table & note estimated sigma here: _____

* Be sure the number of opportunities is not over-stated. Focus only on those types of defects that are critical to the customer and that are reasonably possible.

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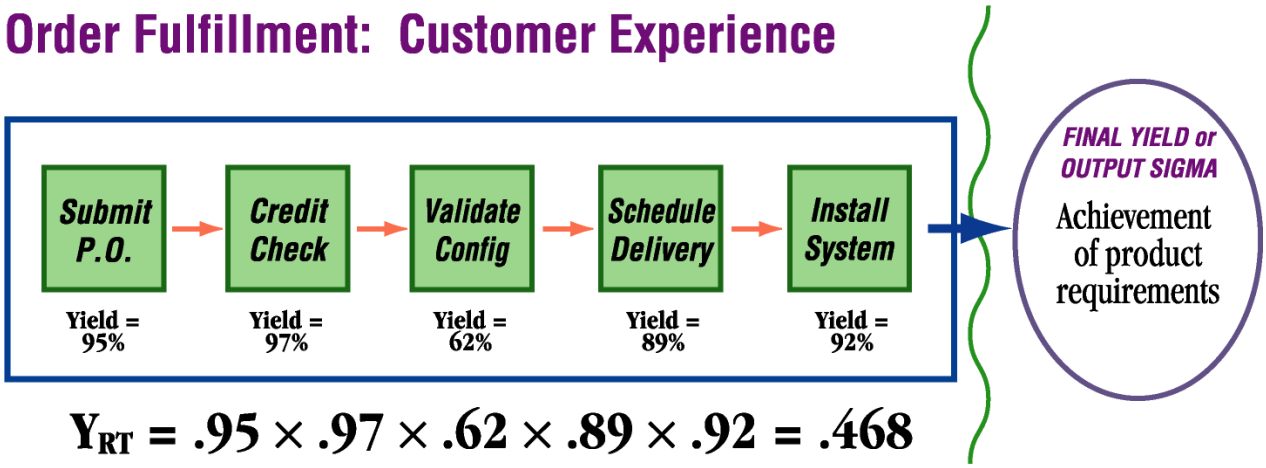
Six Sigma Conversion Table

YIELD (%)	DPMO	SIGMA
6.68	933200	0
8.455	915450	0.125
10.56	894400	0.25
13.03	869700	0.375
15.87	841300	0.5
19.08	809200	0.625
22.66	773400	0.75
26.595	734050	0.875
30.85	**691500**	**1**
35.435	645650	1.125
40.13	598700	1.25
45.025	549750	1.375
50	500000	1.5
54.975	450250	1.625
59.87	401300	1.75
64.565	354350	1.875
69.15	**308500**	**2**
73.405	265950	2.125
77.34	226600	2.25
80.92	190800	2.375
84.13	158700	2.5
86.97	130300	2.625
89.44	105600	2.75
91.545	84550	2.875
93.32	**66800**	**3**
94.79	52100	3.125
95.99	40100	3.25
96.96	30400	3.375
97.73	22700	3.5
98.32	16800	3.625
98.78	12200	3.75
99.12	8800	3.875
99.38	**6200**	**4**
99.565	4350	4.125
99.7	3000	4.25
99.795	2050	4.375
99.87	1300	4.5
99.91	900	4.625
99.94	600	4.75
99.96	400	4.875
99.977	**230**	**5**
99.982	180	5.125
99.987	130	5.25
99.992	80	5.375
99.997	30	5.5
99.99767	23.35	5.625
99.99833	16.7	5.75
99.999	10.05	5.875
99.99966	**3.4**	**6**

First-Pass Yield & Sigma

Order Fulfillment: Customer Experience



$$Y_{RT} = .95 \times .97 \times .62 \times .89 \times .92 = .468$$

53% probability a customer will encounter at least one defect!

YRT stands for "Rolled Throughput Yield."

Balanced Scorecards/Dashboards

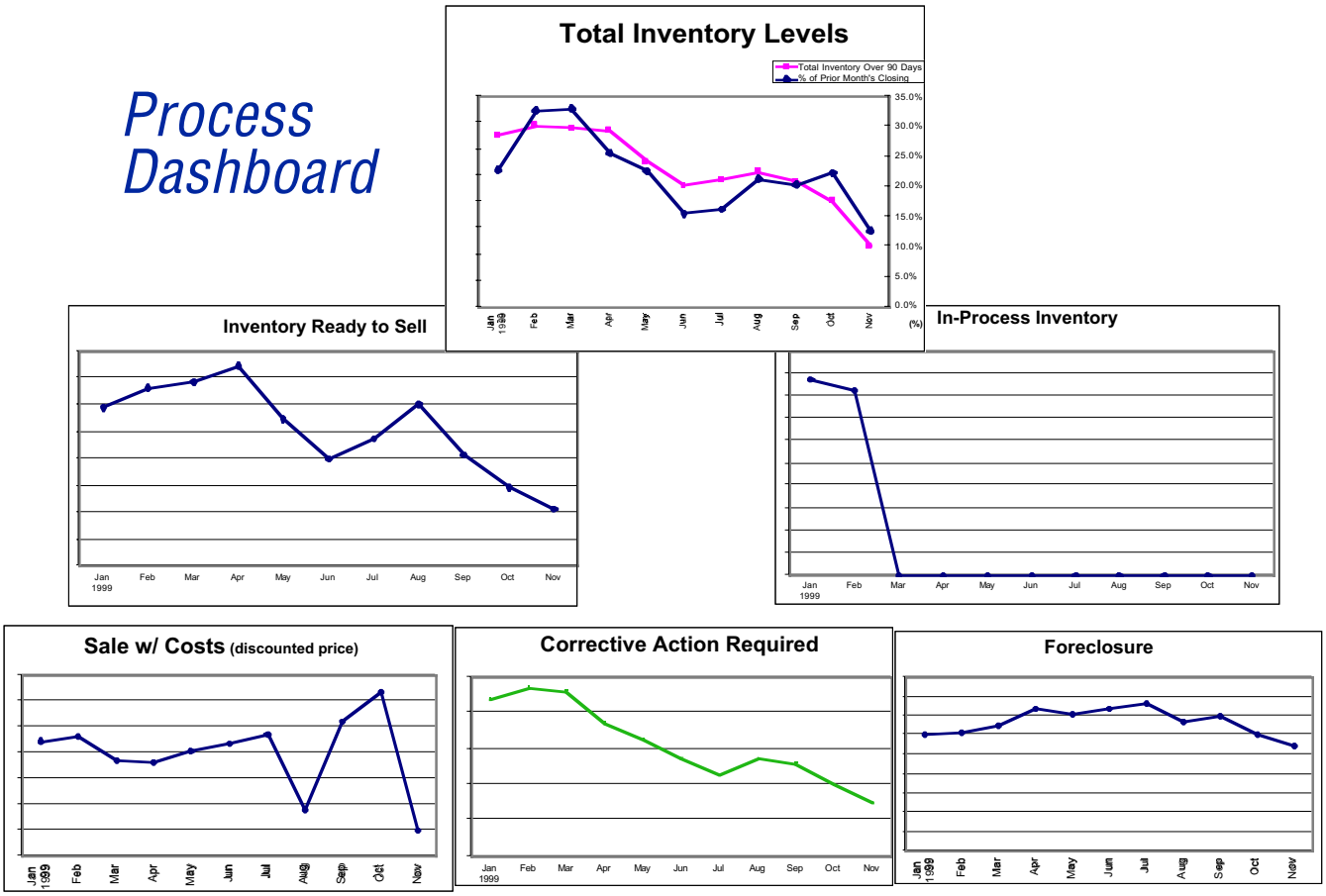
Definition:

A concise compilation of data providing an update on performance (usually presented graphically).

Uses & Benefits:

- **Reviewed on a regularly scheduled basis**
- **Helps keep current on trends, problems, opportunities**
- **Improves cross-functional coordination**
- **Allows fast response to issues as they arise**

Process Dashboard



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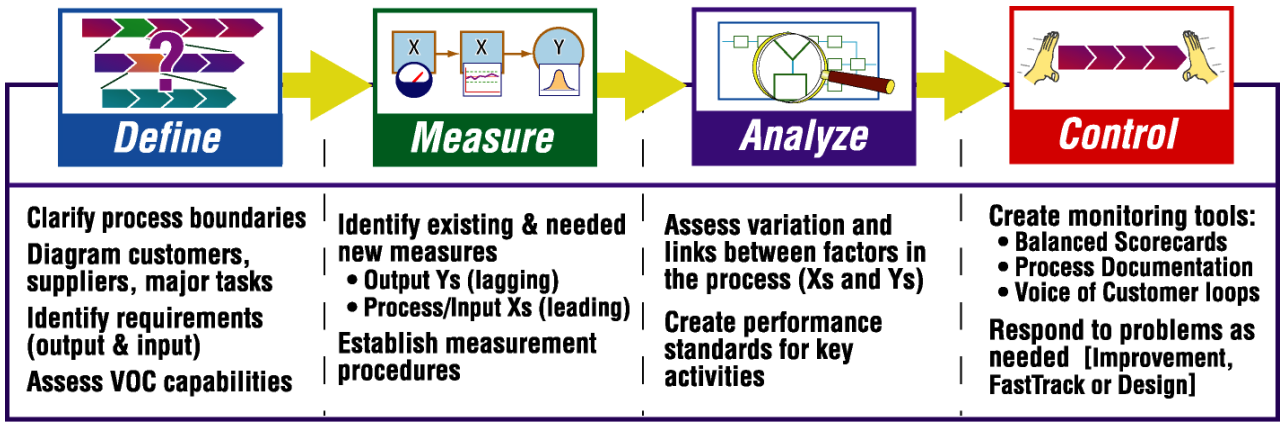
Strengthening the Foundation

Process Management Steps:



SIX SIGMA LEADERSHIP

How to Select & Manage Improvement Projects

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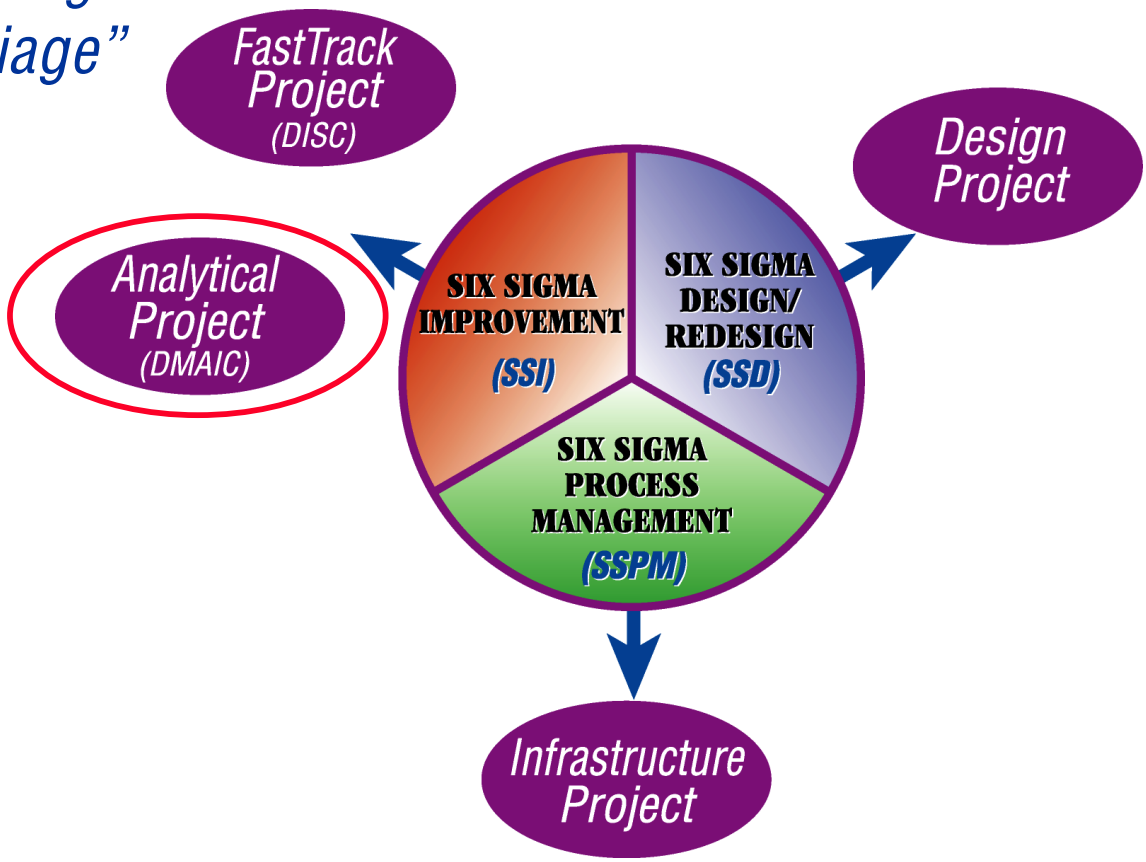
Project Selection Essentials

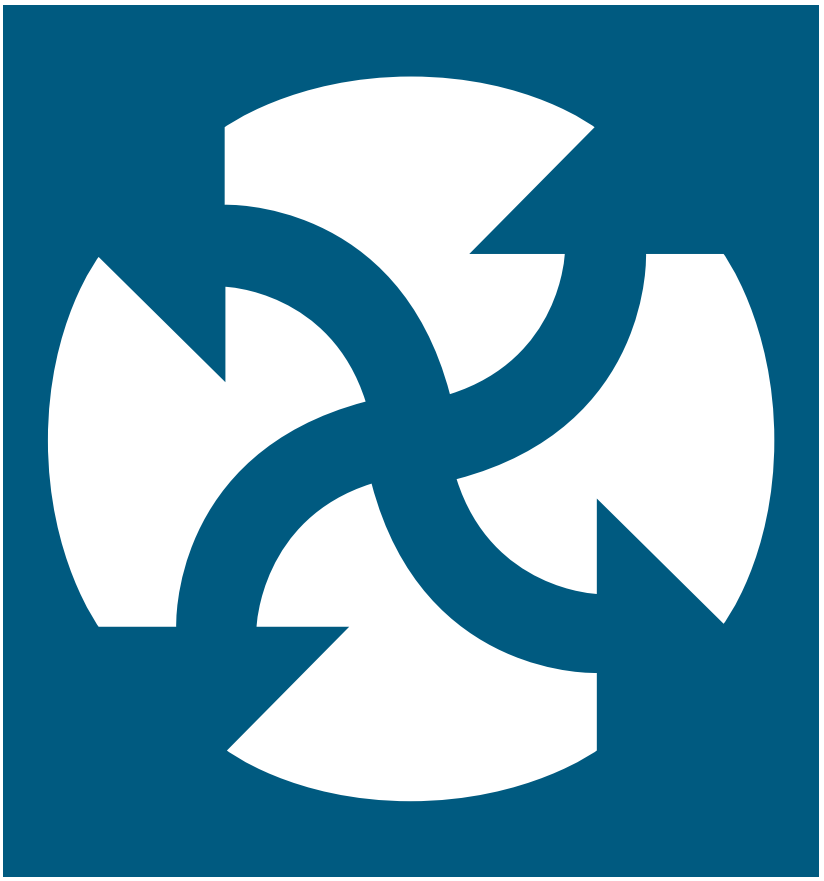
- **Leadership involvement and ownership**
- **Broad input of ideas and opportunities**
- **The *right* kind of problem/opportunity**
- **Clear criteria and link to business needs and strategies**

Six Sigma "Triage"



SITUATION	EXAMPLES	ACTION
My process produces defects. I know my customer requirements. **I know the cause of the defects.**	The faucet in my sink leaks after I overtightened it and saw pieces of gasket come out with the water. Sugar stored next to the salt was mistakenly used in making pizza dough.	Confirm data about the problem (where, when, what, why) and resolve using standard process change procedures. Launch a focused problem solving effort as needed to address the issue. **(FastTrack or DISC)**
My process produces defects. The process is under control. I know my customer requirements. **I don't know the cause of the defects, although I have some good ideas.**	Overall water use at my house is up 30% this year, while requirements are about what they were last year. Delivered pizzas are being returned as "damaged" 10% of the time.	Lead a rapid action session to collect basic data; brainstorm causes; test against data and validate. Brainstorm and implement solutions. **(FastTrack or DISC)**
My process varies and produces defects and cuts across several departments. I'm not sure about my customer requirements. **I don't know the cause of the variation and the defects.**	Dampness and mold appear from time to time in several rooms in my house, damaging paint, wallpaper and flooring. Despite repeated efforts, customer complaints about lost pizza orders continue to be high.	Use cross-functional team to define, measure, analyze, improve and control the process. **(Analytical or DMAIC)**
After several attempts to improve it, my process still produces too many defects for my customers. The overall process appears faulty and involves several departments. **We need a thorough overhaul of the process.**	Pipes are old, leaky, corroded and make noises; fixtures are broken and chipped—only one bathroom for large family. Business is down as customers abandon pizza for more healthy foods. We need to launch a new "Healthy Pizza" menu.	Use cross-functional team to design a new process that meets customer requirements. Team will define-measure-analyze existing process and requirements and create new process. **(Process Design)**
My process is operating normally, with an acceptable level of defects/variation. I know my customer requirements. **I have a good understanding of the process and its operation.**	I check my water bills and carry out routine inspections of plumbing, sinks, showers, and so forth. We've won the "Best Pizza" award at seven of our locations and business continues to grow.	Manage the existing process; monitor and measure normal operations; inspect for variation; update procedures; be on the lookout for any improvements if customer requirements change. **(Process Management)**

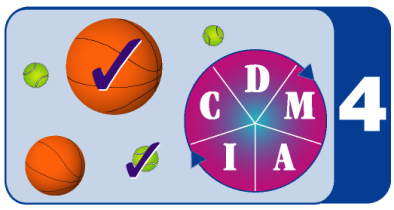
Project Types & Project Selection



Type: Improvement Projects

What:

Take ACTION to improve business performance



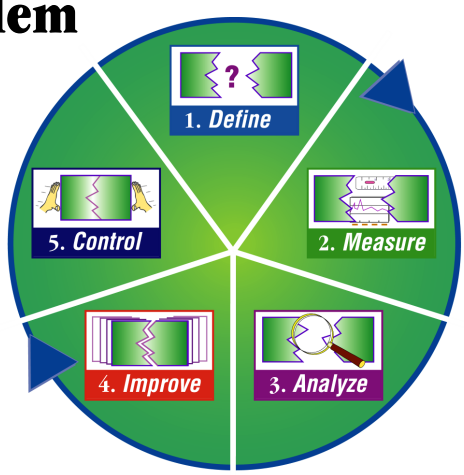
PRIORITIZE, ANALYZE & IMPLEMENT IMPROVEMENTS

Why:

- **Use Sigma & other data to select "projects"**
- **Refine problem/opportunity descriptions**
- **Apply FastTrack, Improvement or Design**
- **Achieve results & manage change**

Analytical Model: DMAIC

- Define – **Describe the process, problem, opportunity & goal (Y)**
- Measure – **Validate the problem & baseline performance**
- Analyze – **Use data & facts to pinpoint the cause (X)**
- Improve – **Develop, test, measure & refine solutions**
- Control – **Establish ongoing measures & response plans**



The DMAIC process (Duh-MAY-ihk) is applied to significant cause-unknown problems and applies a detailed process and data analysis approach to developing and implementing solutions.

A typical time frame for a DMAIC project is from 2 to 6 months.

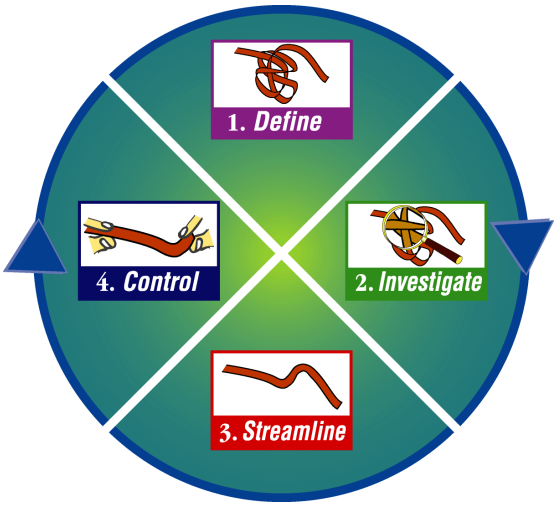
Choosing "DMAIC" Projects

Essential Factors

- **Something's not right (there's a gap)**
  - Pain or problem: efficiency or effectiveness
  - Process, product, service to be designed
- **"Band-aid" solutions are not acceptable**
- **Cause unknown and solution not predetermined**
- **Tend to be larger scope, persistent problems**
- **Potential benefits are high**

FastTrack *Model: DISC*

- Define – **Describe the problem or opportunity & goal**
- Investigate – **Examine the process & available data**
- Streamline – **Identify low-risk solution, implement & verify results**
- Control – **Establish monitoring to maintain the gain**



The *FastTrack* DISC process is similar to the more rigorous DMAIC model, but allows an individual or team to take rapid action under the right conditions. The core Six Sigma themes of Customer, Process and Fact & Data are still fundamental to DISC.

Choosing "DISC" Projects

Essential Factors

- **Something's not right (there's a gap)**
  - Pain or problem: efficiency or effectiveness
  - Miscommunication, rework, "atrocity"
- **Local control with narrow scope**
- **Reasonable cause suspicions &/or potential solutions identified**
  - Simple fixes with low/manageable risk
- **Potential benefits are small to high**

Design Model: DMADV

- Define – **Describe opportunity, vision, phases & gather VOC (Ys)**
- Measure – **Quantify existing process & define metrics**
- Analyze – **Review inputs & interface capability (Xs), clarify assumptions**
- Design – **Create & refine design pilot & expand implementation**
- Verify – **Establish control plans**

The DMAIC process (Duh-MAY-ihk) is applied to significant cause-unknown problems and applies a detailed process and data analysis approach to developing and implementing solutions.

A typical time frame for a DMAIC project is from 2 to 6 months.

Consider Six Sigma Design

IF ...

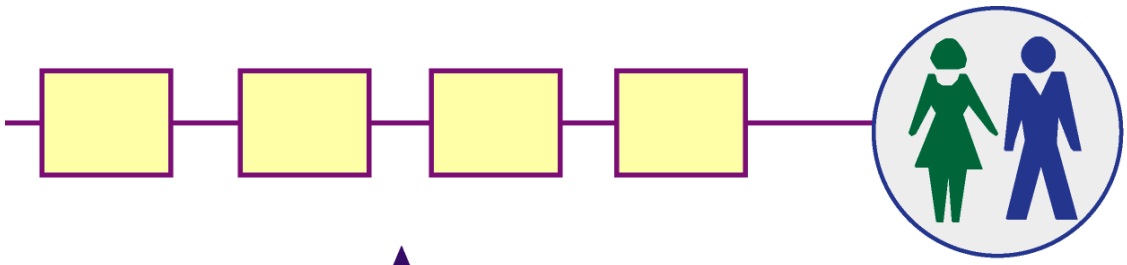
- **A major need or opportunity exists**
  - Competition
  - Untapped customer needs
  - New technology
  - Increase flexibility to meet MORE customer needs
  - Rules have changed (deregulation, new laws)
  - Old assumptions/paradigms invalid
  - Current process is "a mess"

AND ...

- **Longer lead time is acceptable**
- **Resources & talent are available**
- **Leaders & participants are committed**
- **Risk profile is acceptable/manageable**

Project Selection Quandary

Which will pay off first? ...

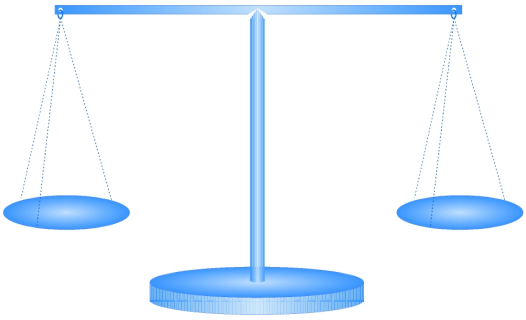


Cut costs by 1%

Improve satisfaction by 2%

Project Selection Criteria

- **Impact on "external" customer**
- **Impact on strategy**
- **Financial benefit**
  - Immediate
  - Long-term
- **Urgency or sequence**
- **Resources needed**
- **Expertise available**
- **Organization "buy-in"**
- **Likelihood of success**
- **Learning experience opportunity**



This is a generic list of priority-selection criteria. You should select the most relevant criteria—4 to 7 in number— when helping set priorities for your improvement effort.

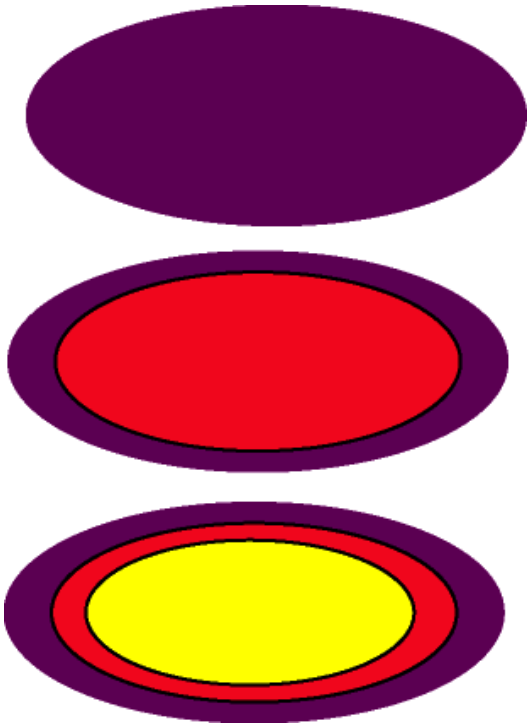
Selecting Six Sigma Projects

Sources of Ideas

- **Strategy, goals, direction**
  - Senior leadership
- **Complaints, praise, requests**
  - "Voice of the Customer"
- **Problems, rework, gaps, frustration**
  - "Voice of the process"
  - "Voice of the team player"

Narrowing the Scope & Focus

- Champions & leaders think: "They can do this."
- Team considers and thinks: "We can do *this.*"
- Reality & time reveal: "You can do *this.*"



A classic challenge of Six Sigma teams—whether Improvement or Design/Redesign—is to realistically size their Problem, Goal and Scope.

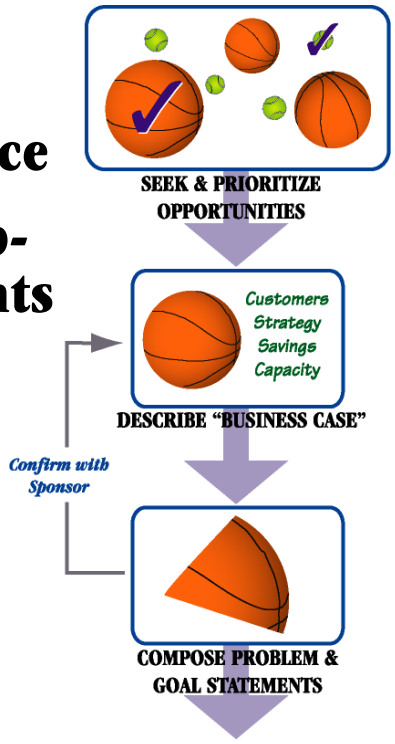
Most often, the focus of the team will *narrow* over time as the real complexity of the challenge becomes more clear.

It's okay to START with a broader scope, and to narrow as needed based on data and analysis (versus a guess). At the same time, beware of setting expectations early in the project that can't be kept.

Sizing & Prioritizing Projects

An iterative effort …

- **Clarify broad issue & importance**
- **Break larger concern into "sub-issues" and problem components**
- **Triage issues:**
  - Assign to immediate action (FastTrack)
  - Select as project focus (Improvement or Design/Redesign)
  - Defer for later action



Sizing & Prioritizing Projects

Who does what?

- **Leaders and Champions**
  - Select broad issues & priorities
  - Define "Business Case" for one or more projects
- **Champion and Black Belt**
  - Agree on component of "Business Case" to be addressed by project
- **Black Belt and Team**
  - Complete Charter & further refine/prioritize
- **Remember the two Ms!**

Meaningful & Manageable

The DMAIC Charter

A document that defines the context, specifics and plans of an improvement project (aka: "project blueprint").

Used to:

- ✓ Define (and narrow) the project's focus
- ✓ Clarify the results being sought
- ✓ Confirm value to the business
- ✓ Establish boundaries & resources for the team
- ✓ Communicate goals and plans

Components of a Charter

DMAIC Team Charter:

1- Business Case

2- Problem/Opportunity & Goal Statements

3- Constraints/Assumptions

4- Scope

5- Players & Roles

6- Preliminary Plan

Business Case

Project Rationale

- **Broad statement of area of concern/opportunity**
- **Impact (benefit) of potential improvement**
- **Impact (cost/risk) of not improving**
- **Link to strategy, customers, values, etc.**
- **Owned by Project Champion**

Business Case

Example: Pizza Delivery

The future growth of the Six Sigma Pizza Restaurant will require an ability to prepare and deliver pizzas quickly and efficiently. Recent problems, along with reports from store managers and team members, indicate that pizza deliveries outside the restaurant are often over the "30 minute" commitment by the time the customer receives their pizza.

Focused efforts are needed to enhance our speed and accuracy in preparing all kinds of pizzas. Slow and inaccurate pizza prep impacts not only our capacity and costs, but frequently is viewed by our customers as a sign that we don't know what we're doing. In addition, the inconsistencies in preparation and delivery methods between store locations hampers team members who wish to move to new positions or step in to fill resource gaps.

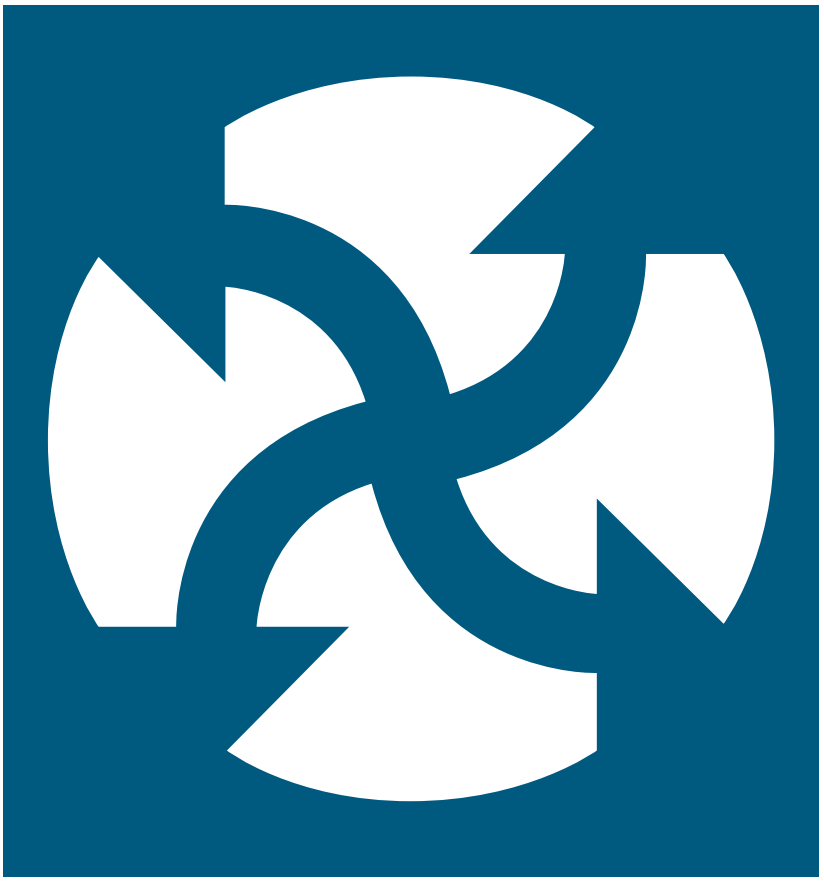
If we continue to in our current haphazard and slow methods of pizza delivery, our goal of becoming the top pizza restaurant in the state is in serious jeopardy.

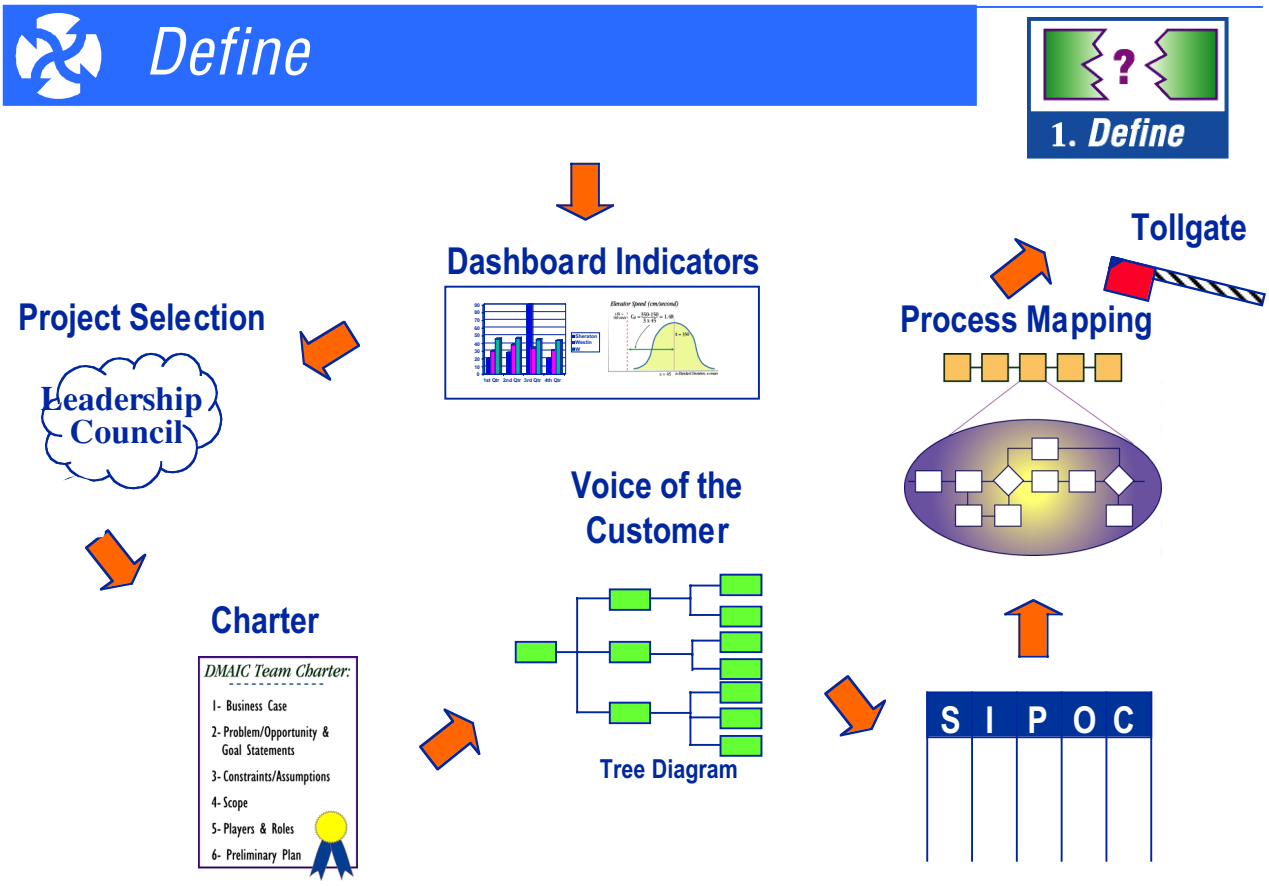
ACTIVITY: Possible Projects

Current Opportunities...

1. **Review current areas of "pain" or opportunity in core processes**
2. **Do a quick "Triage" — Improvement, Design, FastTrack?**
3. **Look for ways to narrow or focus scope**
4. **Identify who'll be responsible to assess and (if needed) draft Business Cases**

Improvement Project Chartering, Tools & Steps





The three key elements addressed in the Define phase of DMAIC are:

1- Clarify the Problem/Opportunity

2- Identify/validate Customer Requirements

3- Identify/document the Process

Problem/Opportunity Statement

Does or Should …

- **Describe the issue, gap, or opportunity**
- **Identify the severity of the pain, size of the opportunity**
- **Gives specifics as available**

Does NOT or Should not …

- **Describe the cause**
- **Attach blame or responsibility**
- **Contain a prescribed solution**

The purpose of the Problem Statement is to describe what's wrong.

It gives the DMAIC team a focus for its efforts.

Problem/Opportunity Statement

Example A:

We've been trying to get Six Sigma Pizza's on-line ordering system running for two years. People are not cooperative and the current design is too complicated. If we don't get it done, we'll lose market share.

Example B:

Six Sigma Pizza is failing to meet its 30-minute home delivery commitment over 26% of the time. Free pizza "make-goods" are costing over $3.7 million company wide. Meanwhile, Customer feedback indicates a high degree of dissatisfaction with our delivery performance and defections to Big Evil Pizza Company. The amount of business lost to-date is unclear, but appears to be increasing.

Goal Statement

- **Identifies the critical outcome of the Six Sigma project**
  - → Focused solution (SSI)
  - → New process, product or service (SSD)
- **Describes target/results and quantifiable benefits**
  - → Linked to project vision
- **Includes time frame for implementation and/or results**
- **Should NOT pre-judge the solution or design**

The purpose of the Goal Statement is to describe the results the DMAIC team hopes to achieve.

It sets an objective and target (even inspiration) for the team.

Remember the key criteria:

Measurable & Meaningful

Goal Statement

Example: The "Perfect Pizza" Team:

Reduce cycle time for pizza deliveries to meet our "30 minutes or less" target. Our goal is to achieve improved pizza deliveries by *(date TBD)* of this year.

Quality Function Deployment (QFD)

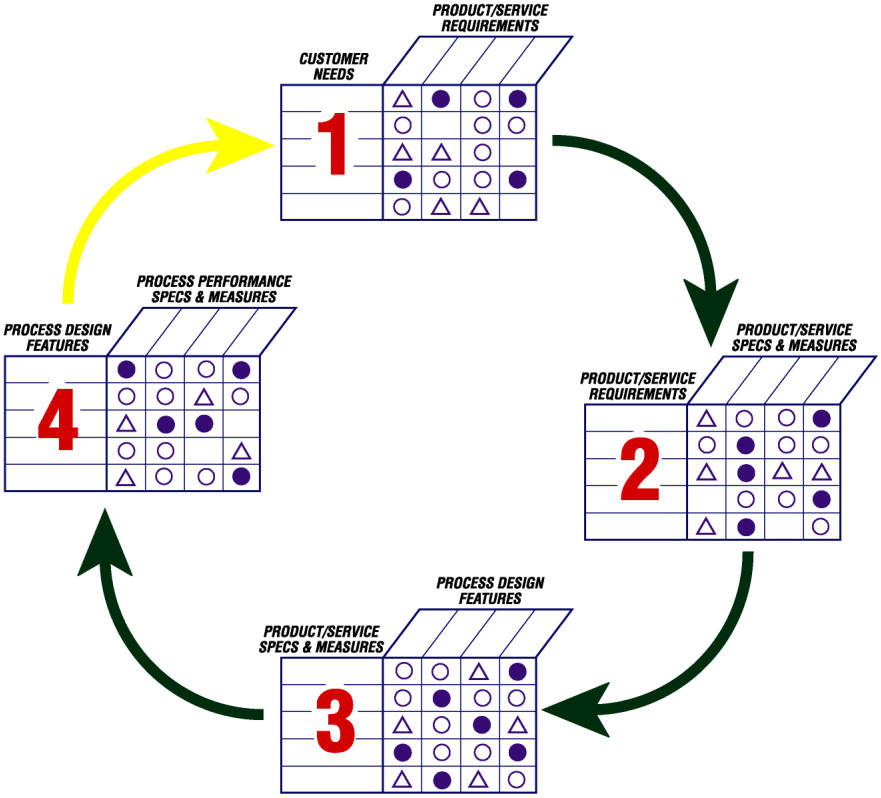
A process (with supporting tools) for identifying, correlating and prioritizing customer requirements—and designing product/service and process features to meet the requirements.

Designing a Pen

CUSTOMER REQUIREMENTS	PRODUCT/SERVICE FEATURES: choice of point sizes	variety of ink colors	choice of finishes (gold, marble, etc.)	3 price levels ($12, $40, $75)	available neck chain	non-toxic ink	retailed at jewelers & specialty shops	sold direct through WEB
stylish	○	○	●	●	△	△	●	△
multiple choices	●	●	●	●	○	△	○	○
safe to use	△	△	△	△	△	●	△	△
value for money	△	△	●	●	○	○	△	●
hard to lose	△	△	○	△	●	△	△	△

CONTRIBUTION: ● STRONG ○ MODERATE △ WEAK/NONE

QFD Cycle


PRODUCT/SERVICE REQUIREMENTS
CUSTOMER NEEDS
1
PRODUCT/SERVICE SPECS & MEASURES
PRODUCT/SERVICE REQUIREMENTS
2
PROCESS DESIGN FEATURES
PRODUCT/SERVICE SPECS & MEASURES
3
PROCESS PERFORMANCE SPECS & MEASURES
PROCESS DESIGN FEATURES
4

Charter: Review

DMAIC Team Charter:

1- Business Case

2- Problem/Opportunity & Goal Statements

3- Constraints/Assumptions

4- Scope

5- Players & Roles

6- Preliminary Plan

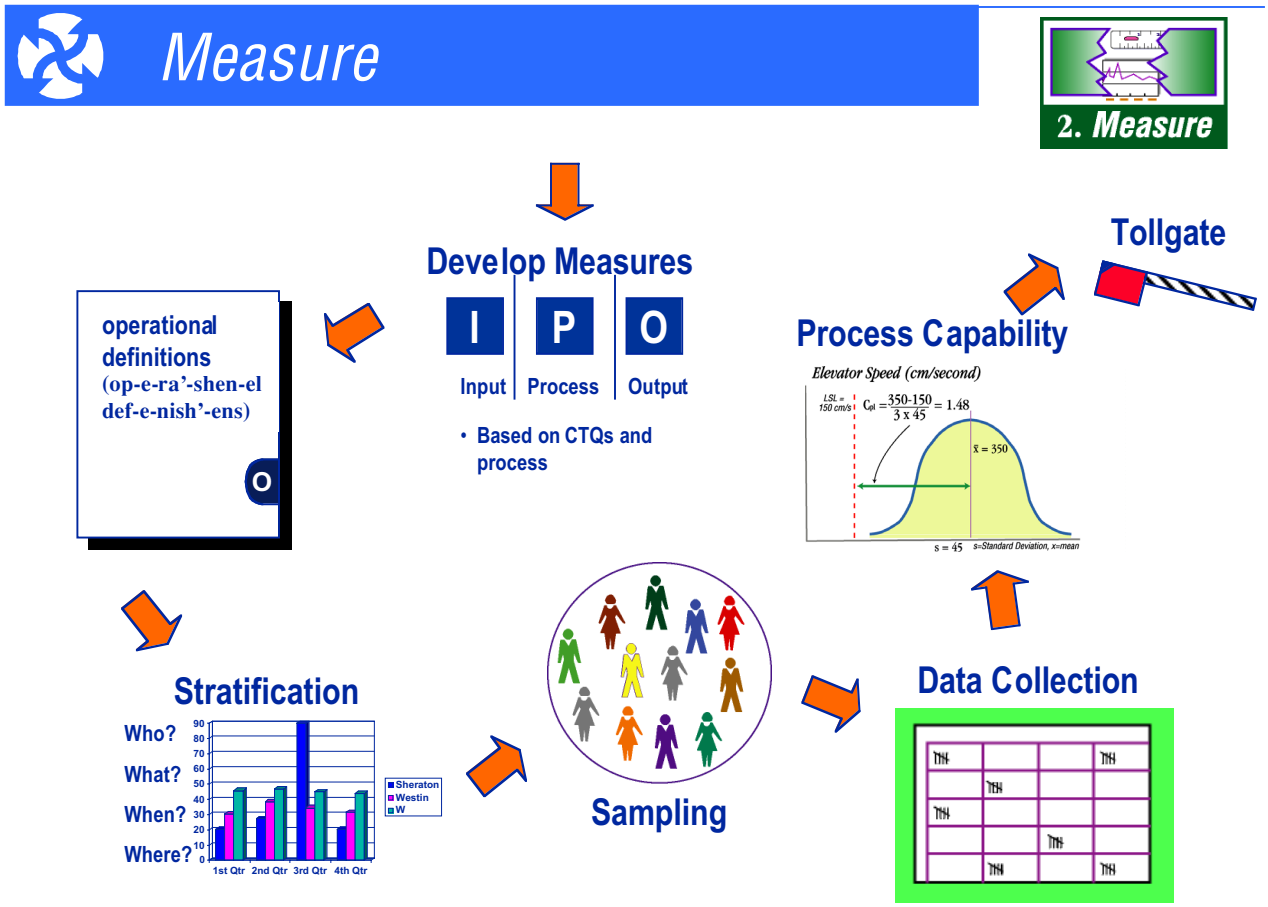
Define Checklist

Instructions:

If you can respond "yes" to each statement below, you're off to a good start with your project and are ready to move into the "Measure" phase of DMAIC.

For our project we have ...

1.	Confirmed that our project is a worthwhile improvement priority and is supported by the business checklist.	YES	NO
2.	Been given (or written) a brief business case explaining the potential impact of our project on customers, profits, and its relationship on business strategies.	YES	NO
3.	Composed and agreed to a two- to three-sentence description of the problem as we see it—the Problem Statement—focusing on symptoms only (not causes or solutions).	YES	NO
4.	Prepared a Goal Statement defining the results we're seeking from our project, with a measurable target (or placeholder to add one). No solutions are proposed in the Goal Statement.	YES	NO
5.	Prepared other key elements of a DMAIC team charter, including a list of constraints and assumptions, a review of players and roles, a preliminary plan and schedule, and (if needed) a process scope.	YES	NO
6.	Reviewed your charter with your sponsor for this project and confirmed his/her support.	YES	NO
7.	Identified the primary customer and key requirements of the process being improved and created a SIPOC diagram of the areas of concern.	YES	NO
8.	Prepared a detailed process map of areas of the process where we expect to focus our initial measurement.	YES	NO



The major tasks involved in the Measure phase of DMAIC are:

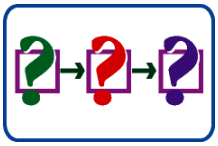
1- Selecting and prioritizing the Right Measures

2- Preparing clear and consistent Operational Definitions of what the measures mean

3- Developing efficient and effective Data Collection and Compilation

4- Applying measurement data to Baseline Problems, Assess Process Capability, and begin Data Analysis

Measure Selection/Definition



Key considerations:

- **What information will be really useful?**
  - Tracking performance to customer requirements (Ys)
  - Measuring business results (Ys)
  - Leading indicators & guides to performance (Xs)
- **What resources are needed/available?**
  - Systems versus manual data collection?
  - Is data easy to access cost-effectively?
  - Are there existing measures we can STOP doing?
- **What's the most appropriate expression & use of the measure?**
  - Variation, average, "alert" signal?
  - How often & where reported/reviewed? To whom?

Types of Data

Continuous – any variable measured on a continuum or scale that can be infinitely divided. Primary types include time, dollars, size, weight, temperature, speed.

Discrete or Attribute – a count, proportion or percentage of a characteristic or category. Service process data is often discrete.

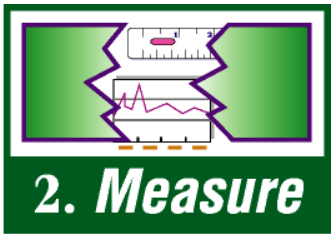
Continuous	Discrete/Attribute
• Cycle time	• Number of customers
• Cost or price	• Gender
• Decibels	• Region/location
• Distance	• Type of defect

Decisions on what to measure should take into account the *type* of data you can collect. One of the more important considerations involves the option of taking Continuous or Discrete measures.

Of these two types, Continuous is usually preferable. Advantages include the ability to draw conclusions from smaller sample sizes and greater ability to perform statistical analyses.

Discrete data, however, may be the only option in many processes—and it can be simpler to gather. For example, any instance when you count "defects" is in essence a discrete measure.

Measure Checklist

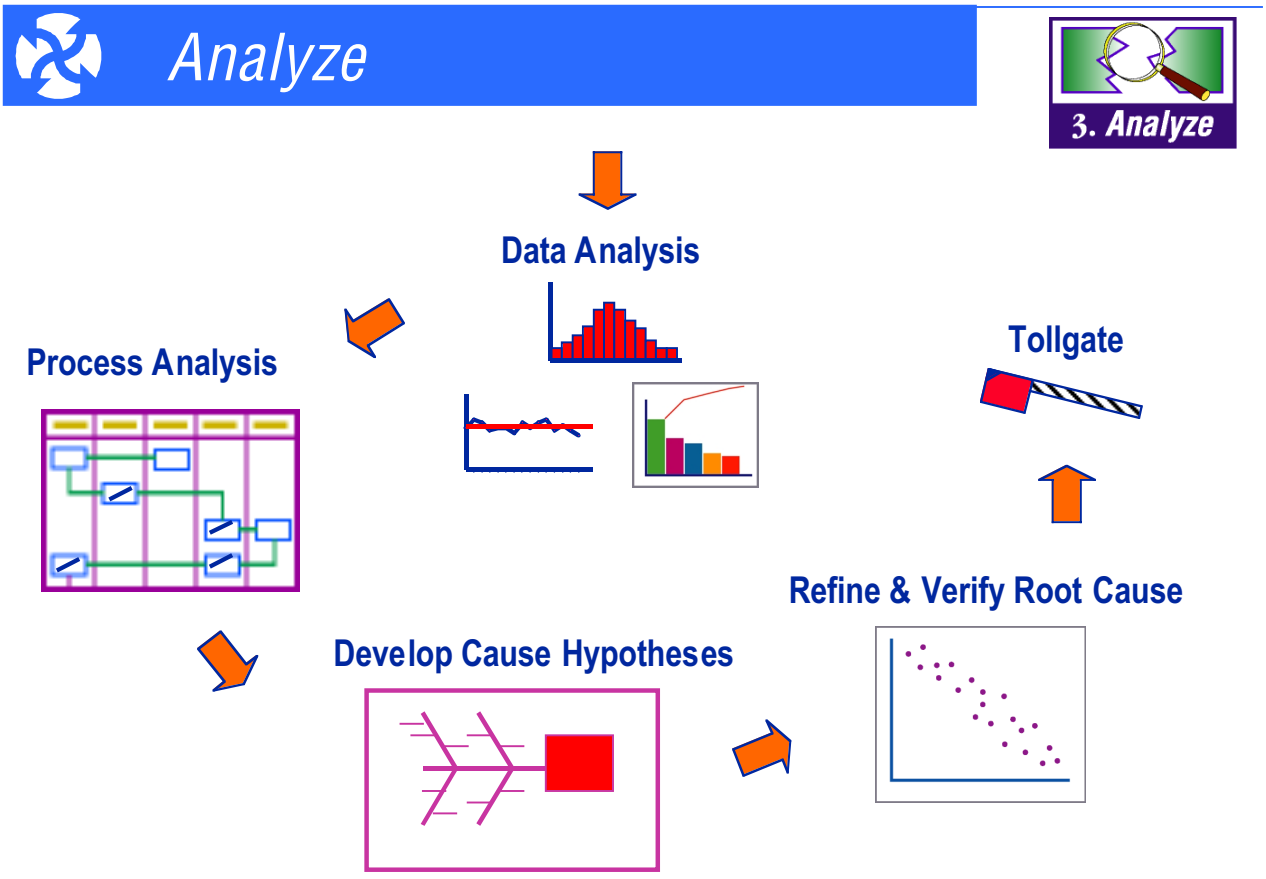


Instructions:

If you can respond "yes" to each statement below, you're doing well with measurement and are ready to move into the Analyze phase of DMAIC.

For our project we have ...

1.	Determined what we want to learn about our problem and process and where in the process we can go to get the answer.	YES	NO
2.	Identified the types of measures we want to collect and have a balance between effectiveness/efficiency and input/process/output.	YES	NO
3.	Developed clear, unambiguous operational definitions of the things or attributes we want to measure.	YES	NO
4.	Tested our operational definitions with others to ensure their clarity and consistent interpretation.	YES	NO
5.	Made a clear, reasonable choice between gathering new data or taking advantage of existing data collected in the organization.	YES	NO
6.	Clarified the stratification factors we need to identify to facilitate analysis of our data.	YES	NO
7.	Developed and tested data collection forms or checksheets that are easy to use and provide consistent, complete data.	YES	NO
8.	Identified an appropriate sample size, subgroup quantity and sampling frequency to ensure valid representation of the process we're measuring.	YES	NO
9.	Prepared and tested our measurement system, including training of collectors and assessment of data collection stability.	YES	NO
10.	Used data to prepare baseline process performance measures, including proportion defective and yield.	YES	NO



The major tasks involved in the Analyze phase of DMAIC are:

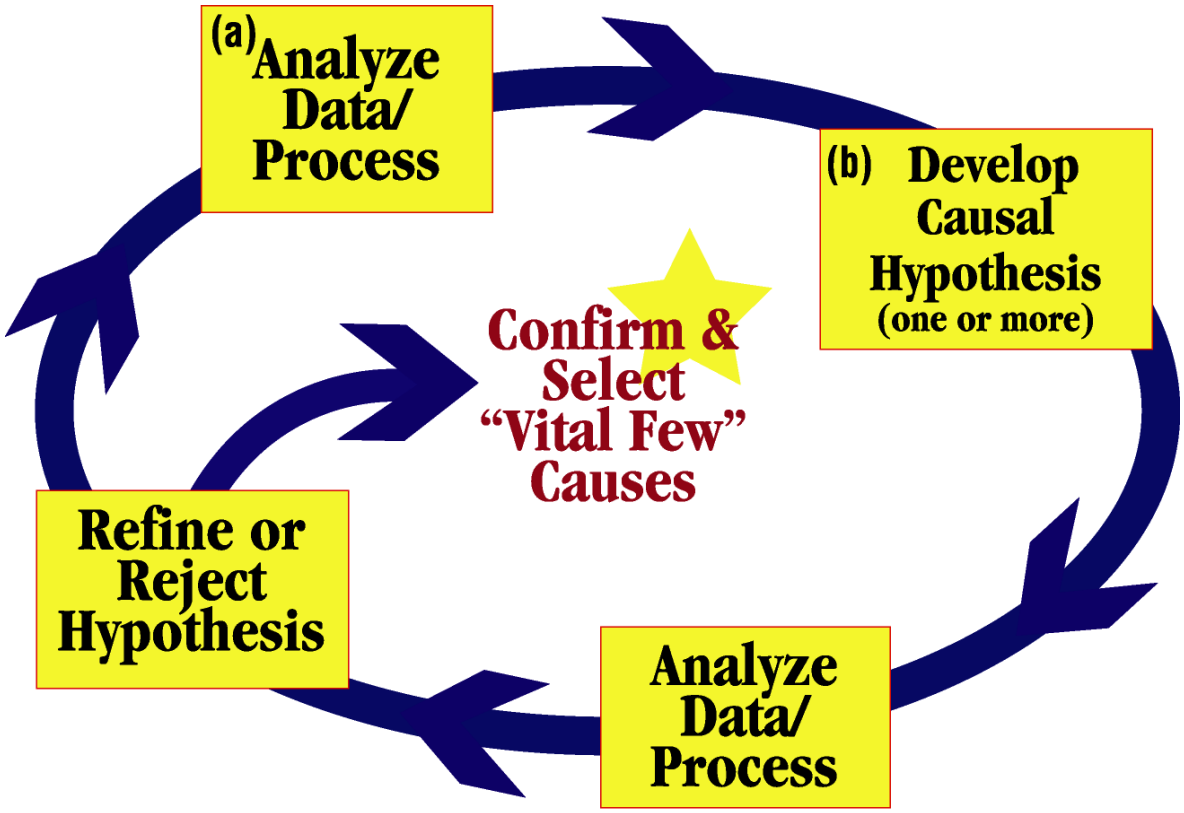
1- Performing graphical and/or statistical Data Analysis

2- Looking more closely at today's or the intended future process design in a Process Analysis

3- Developing Cause Hypotheses (for Improvement) or conducting Assumption Busting (Design/Redesign)

4- Verifying Root Causes and developing sufficient Process/Product Knowledge to begin developing effective solutions

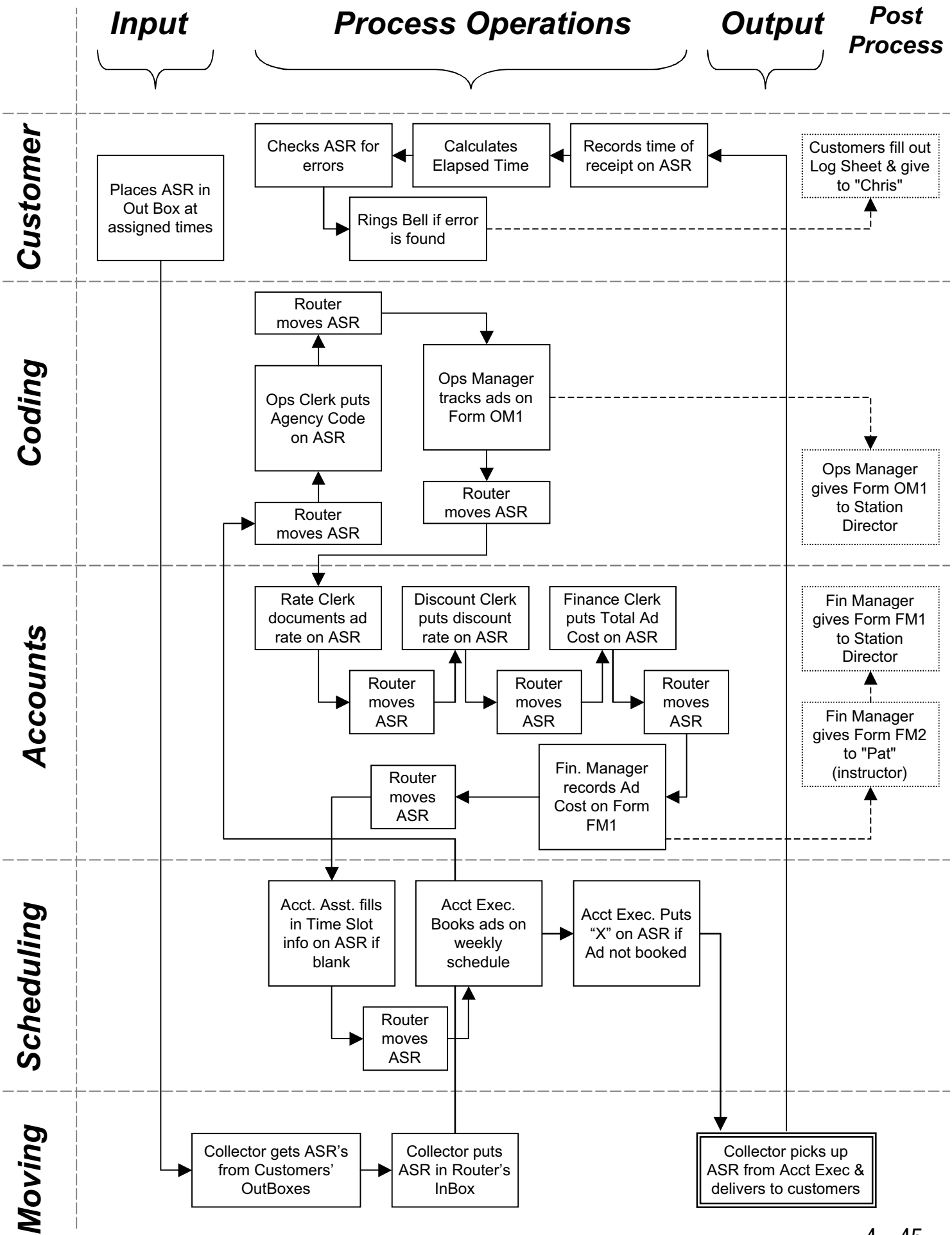
The Analyze Cycle



Process Analysis

Approach

1. **Use (or Create) detailed process maps**
2. **Validate the process**
   - Examine the map
   - Interview process participants
   - Review measures
3. **Investigate for clues, design ideas**
   - Bottlenecks, Loops, Redundancies, Inspections
   - Use to help identify possible root causes
   - Watch for possible "Quick Hits"


Input
Process Operations
Output
Post Process
Customer
Coding
Accounts
Scheduling
Moving
Places ASR in Out Box at assigned times
Checks ASR for errors
Calculates Elapsed Time
Records time of receipt on ASR
Rings Bell if error is found
Customers fill out Log Sheet & give to "Chris"
Router moves ASR
Ops Clerk puts Agency Code on ASR
Ops Manager tracks ads on Form OM1
Router moves ASR
Router moves ASR
Ops Manager gives Form OM1 to Station Director
Rate Clerk documents ad rate on ASR
Discount Clerk puts discount rate on ASR
Finance Clerk puts Total Ad Cost on ASR
Router moves ASR
Router moves ASR
Router moves ASR
Fin Manager gives Form FM1 to Station Director
Fin Manager gives Form FM2 to "Pat" (instructor)
Router moves ASR
Fin. Manager records Ad Cost on Form FM1
Acct. Asst. fills in Time Slot info on ASR if blank
Acct Exec. Books ads on weekly schedule
Acct Exec. Puts "X" on ASR if Ad not booked
Router moves ASR
Collector gets ASR's from Customers' OutBoxes
Collector puts ASR in Router's InBox
Collector picks up ASR from Acct Exec & delivers to customers

Value Analysis

Assessing Types of Tasks

Value Adding: Steps essential to deliver product or service according to customer requirements. Three criteria:

1. Transforms the item or service toward completion
2. Customer would be willing to pay for it
3. Done right the first time

Value Enabling: Steps that allow overall greater effectiveness or efficiency in the process

Non-Value Adding: Steps that do not qualify as Value Adding or Enabling

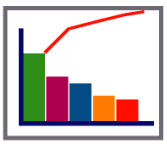
The concept of "value" in this analysis is strict and precise: Value must be viewed in the eyes of the CUSTOMER.

If an activity does not contribute to the end product or service being provided to the customer—or help them feel better about the experience—it's probably Non-Value-Adding, or perhaps Value Enabling (which help us better add value to the customer).

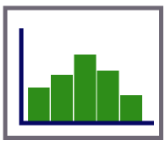
Many business activities—for example, selecting new employees, purchasing supplies, balancing the books, may be critically important to the company, but are really not value-adding to the customer.

Using this strict definition can help you look more honestly at work from the context of who benefits from it—and better prioritize time and resources.

Data Display/Analysis Tools

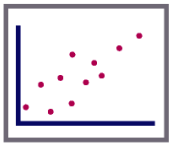


Pareto Chart: Discrete
Compares categories of factors (stratified data) to help validate problem, narrow scope, target causes

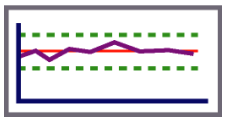


Histogram/Frequency Plot: Continuous/Discrete
Shows range & distribution of variation (Central Tendency and Dispersion)

Run/Trend Chart: Continuous or Discrete
Displays change/variation & patterns over time



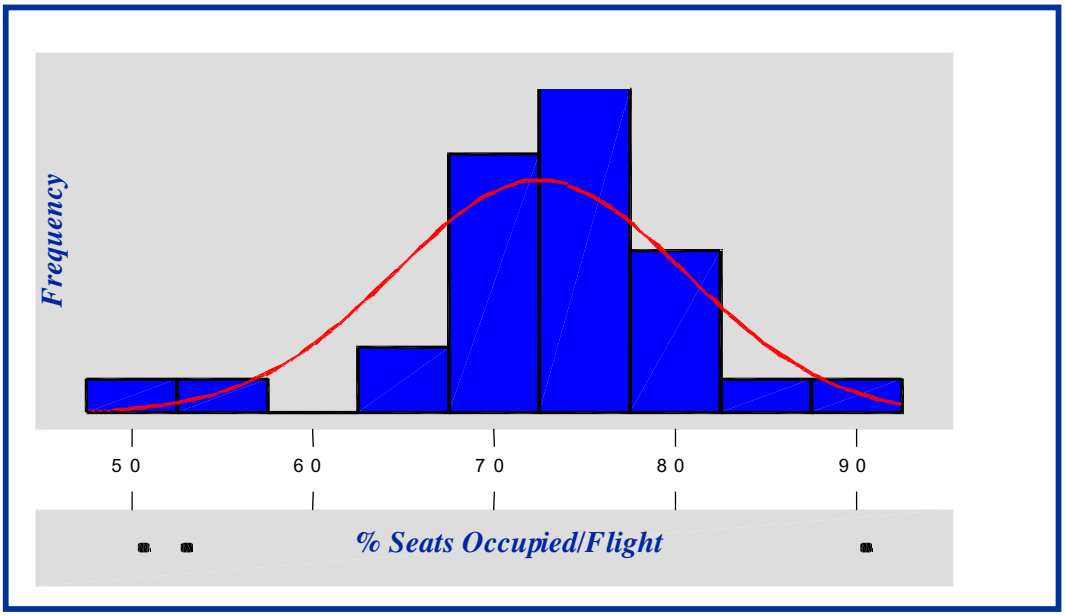
Scatter Plot: Paired Data
Shows relationship or "correlation" between two factors or variables



Control Chart: Discrete or Continuous
Displays process control or degree of variation

Histogram: Center, Spread & Shape

Transcontinental Flight Loads 1999-2000

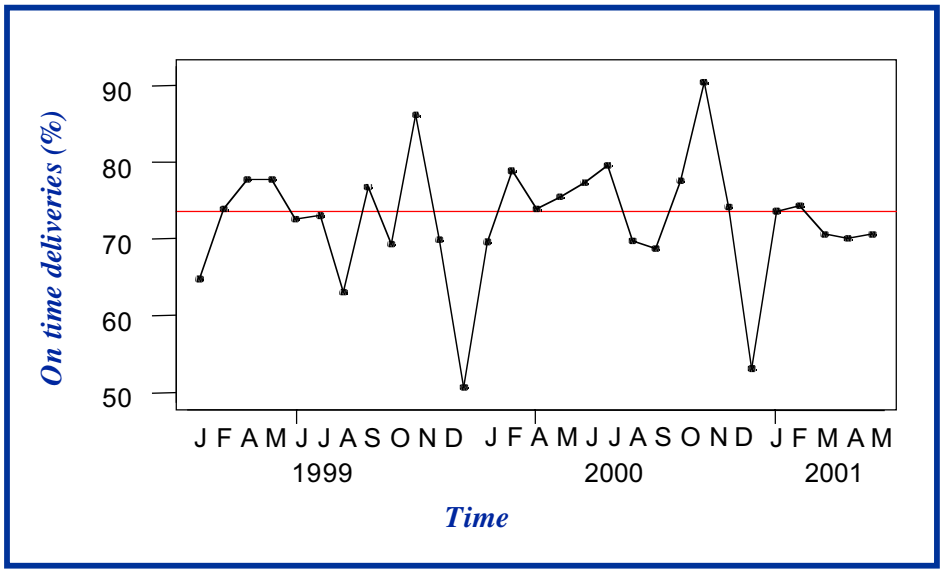


Run Chart: Variation over Time

3. Analyze

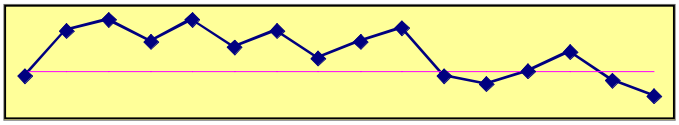
HiGrade Server Systems

Order Fulfillment Performance 1998-2000

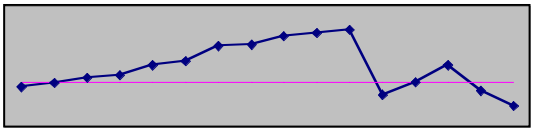


Run Chart Signals: Special Causes

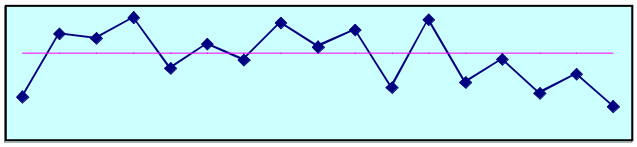
- **SHIFTS:** 8 or more consecutive points on same side of median



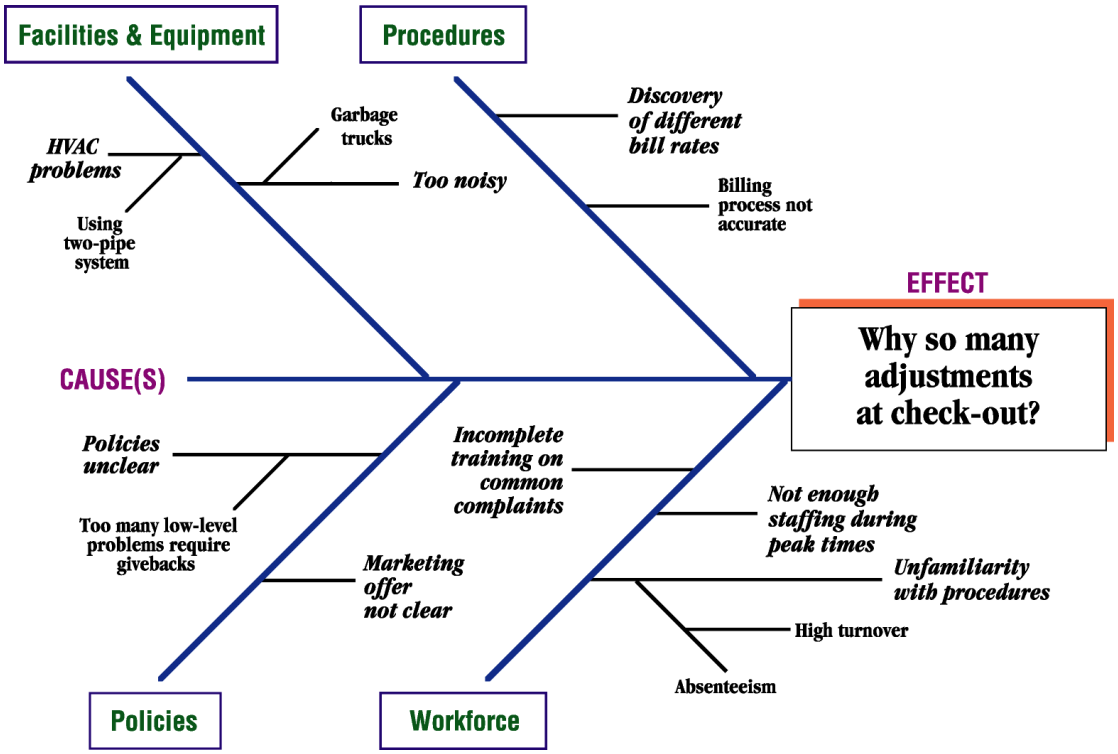
- **TRENDS:** 7 or more points continuously increasing or decreasing



- **ALTERNATING POINTS:** 14 or more consecutive points "up-and-down"



Cause & Effect Example

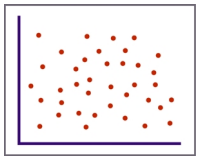


The Five Whys

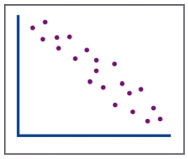
1. **The U.S. Standard RR gauge is 4' 81/2"** Why?
2. **That's the gauge of English rails** Why?
3. **Based on wagon wheel spacing** Why?
4. **That was the spacing of ruts in the road** Why?
5. **Created by Roman war chariots** Why?

➨ Root Cause?

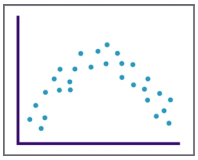
Scatter Plots



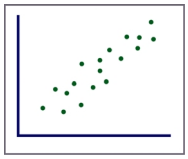
No Correlation



Negative



Curvilinear

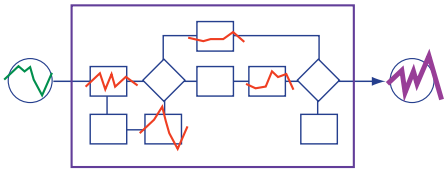


Positive

- **See how one factor relates to changes in another**
- **Develop &/or verify hypotheses**
- **Judge strength of relationship by width or tightness of scatter**
- **Apply statistical tools to validate causal link**

Don't assume a causal relationship!

Tests of Statistical Significance



- **A group of methods used to determine the significance & amount of variance in data**
  - Used when testing causal hypotheses or design factors
  - Examine differences between populations
  - Identify impact of factors on a response variable
- **Provides validation of factors impacting the process, product &/or service**
- **Key techniques: t-test, Chi-Square, F-ratios, ANOVA, Simple Linear and Multiple Regression**

Analyze Checklist

Instructions:

If you can respond "yes" to statement 7 below, and have done many of the tasks described in the other statements, chances are good you are ready to begin developing solutions in the "Improve" phase of DMAIC.

For our project we have ...

1. Examined our process and identified potential bottlenecks, disconnects and redundancies that could contribute to the problem on which we are focusing. YES NO

2. Conducted a value and cycle time analysis, locating areas where time and resources are devoted to tasks not critical to the customer. YES NO

3. Analyzed data about the process and its performance to help stratify the problem, understand reasons for variation in the process, and identify potential root causes. YES NO

4. Evaluated whether our project should focus on process design or redesign, as opposed to process improvement, and confirmed our decision with the project sponsor. YES NO

For Process Design/Redesign:

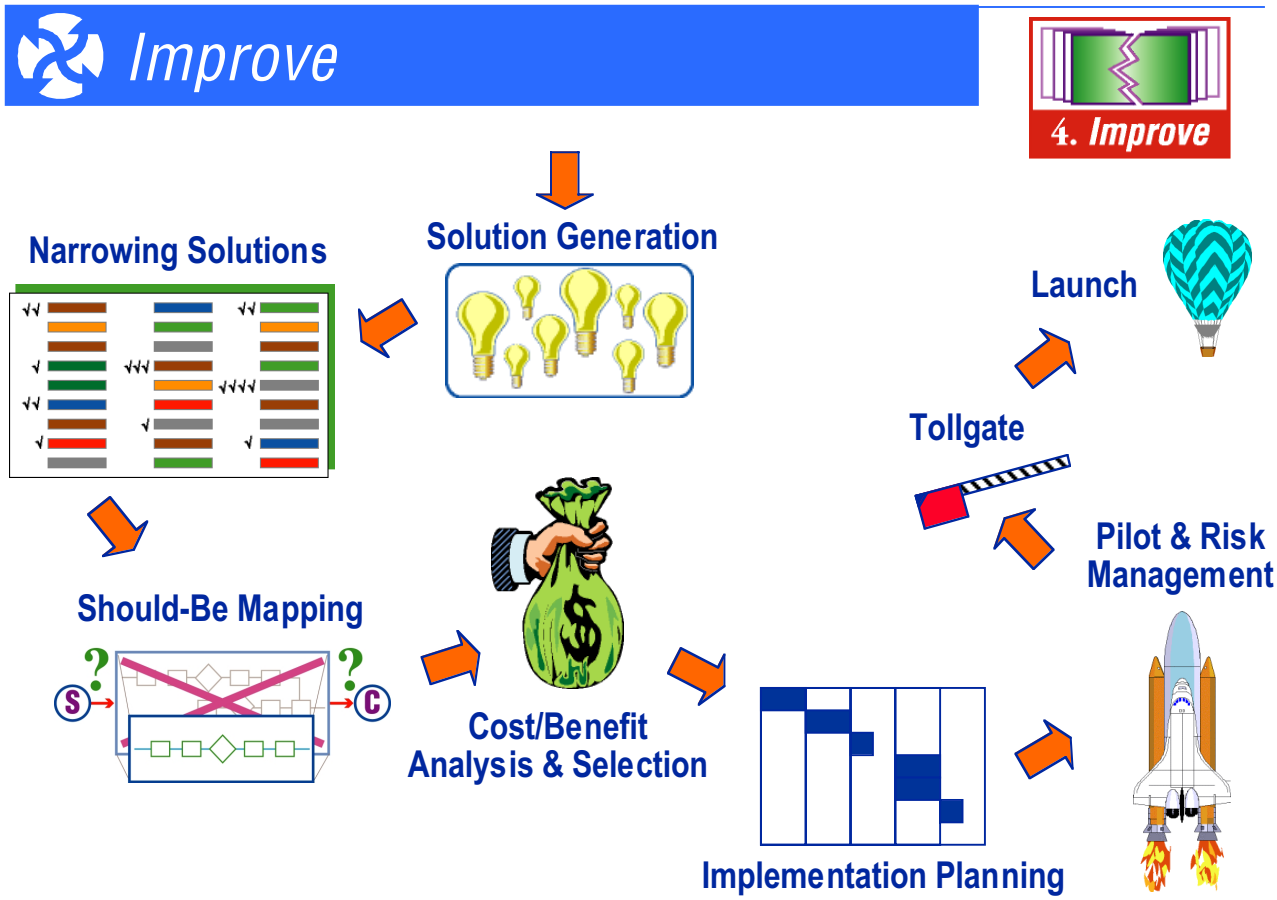
5. Ensured that we understand the key workings of the process so we can begin creating a new process to make your business more efficient and effective. YES NO

For Process Improvement:

6. Developed root cause hypotheses to explain the problem we're solving. YES NO

7. Investigated and verified our root cause hypotheses, so that we are confident we have uncovered one or more "vital few" root causes that create our problem. YES NO

8. Added Analyze information to Storyboard and updated from previous steps. YES NO



The major tasks involved in the Improve phase of DMAIC are:

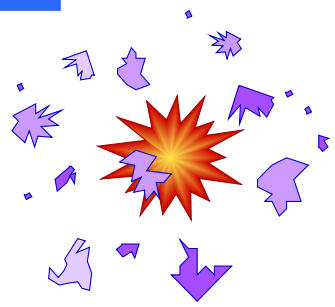
1- Conducting thorough Idea Generation as raw material for innovative solutions

2- Synthesizing and Narrowing ideas into coherent solutions and/or process design proposals

3- Selecting and Piloting solutions that hold greatest promise to achieve results cost effectively

4- Implementing and Expanding Solutions using effective Planning and Risk Management

Assumption Busting Process



Listen for assumption-based phrases and turn them around:

- **Identify what premise, rule or experience creates team discomfort**
- **Ask: "Is this premise valid?" "Could I/we be wrong?"**
- **Consider ways to test the premise: ask customers, talk to team players; get expert advice; see how others do it, etc.**
- **Identify actions the team can take to make the new assumptions work**
- **Take TIME to get used to a new way of seeing things**

A more analytical approach is to look directly for the rules or premises that generate your concerns or assumptions.

One of the most important factors in getting people to abandon their assumptions is time. It may be that a promising innovative idea won't work today—but will be acceptable to people in a few days or weeks ... after they've had a chance to "get used to the idea."

Solution Screening

Meeting the Basic Requirements

- **A filter for potential solutions**
- **Last check prior to formal decision**
- **Three key questions:**
  - Does the solution have clear potential to meet our Goal?
  - Will it eliminate or protect the process from the root cause(s)?
  - Will it be acceptable to the process customer?

Objectives of a Pilot

- **Experiment with the design**
- **Gather quantifiable results**
  - track and measure process for "real" data
  - compare data to initial charter (problem/goal statements)
  - determine pilot impact & best guess calculations for full scale implementation
- **Make changes/improvements as needed**
- **Gain buy-in and commitment**
- **Prepare/plan for full scale repeatability of process**

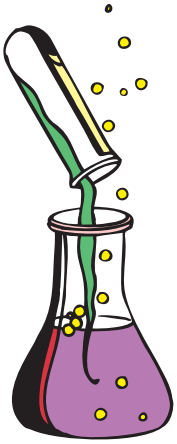
Piloting strategies can include:

- A specific geographic area
- A limited time frame (week, month, hour)
- A limited type of product or customer
- A specific segment of the organization
- Selected individuals within a work group

Pilots that closely compare a test group with a "control" group are essentially experiments. In sophisticated process improvement efforts, designing an experiment to test the effects of different factors or variables can help a team optimize process performance and choose the best combination of solutions. This more detailed piloting approach is called "Design of Experiments" or DOE.

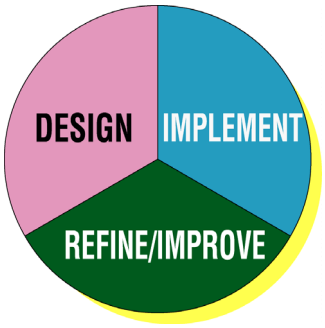
Design of Experiments (DOE)

- **Controlled tests to evaluate effects—& interactions—of factors in a process/product**
  - at least two repetitions required
  - more repetitions yield higher confidence
- **Range from simple (2 factor) to sophisticated multi-factored analyses**
  - complexity & costs increase as factors are added
- **Required basic process understanding**
  - process flow, input, output & process variation
  - process stability
- **Uses correlation, ANOVA & related techniques**



Redesign Options

Change or Improve



- **Customer Interface**
  - Rethink Outputs & Requirements
  - Customer involvement & responsibility
  - More/fewer "Moments of Truth"
- **How the Process Flows**
  - Parallel processing
  - One-at-a-time processing (start to finish)
- **Knowledge Requirements**
  - Appreciation/accountability for entire job
  - Line of sight from process to process
  - Knowledge Workers

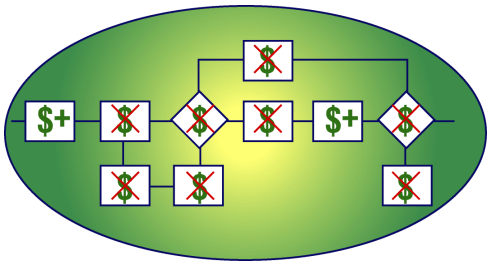
Redesign Options (continued)

- **Who does what**
  - Shift responsibility
  - Move to more appropriate location
  - Outsource or insource
- **Use of technology**
  - Maximizing existing systems/equipment
  - Automate or go manual

Process Design/Redesign

Tools to Create a New Process

- **Value & Cycle Time Analysis**
- **Quality Function Deployment**
- **Best Practices Research**
- **Assumption Busting**
- **Workflow Design**
- **Should-Be Process Mapping**
- **Failure Modes & Effects Analysis**
- **Design of Experiments**



FMEA

Failure Modes & Effects Analysis

- **Method to understand criticality of errors & defects which could result in a threat to quality, safety or reliability**
  - "Failure modes" = types of possible error or defect
  - Looks at common or rare events & relative risk
- **Useful in implementing improvements, redesign or design of processes**
- **Also a tool for process owners to allocate prevention resources**

"Poka-Yoke" : Mistake Proofing

Focusing on the "Meaningful Many"

- **Designing processes & tasks to ensure error-free execution**
  - Anticipating errors to make processes "fail-safe"
  - Allows for preventive actions to be part of process design
- **Creating alarm signals to catch defects as or before they occur**
- **Initiating individual accountability to "double-check" work before handing off to another step in the process**

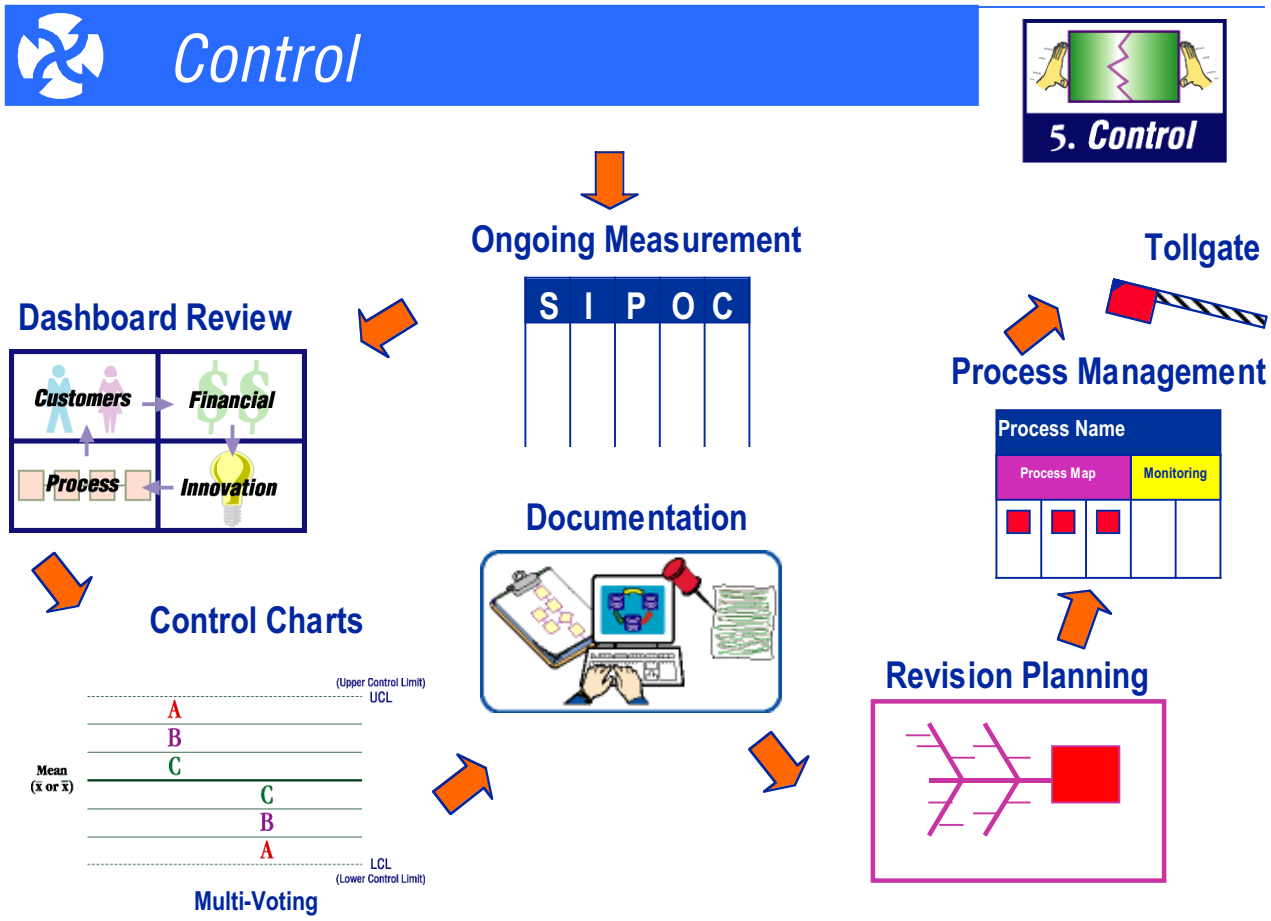
Improve Checklist

Instructions:

If you can respond "yes" to each statement below, you've achieved success with your improvment, and are ready to plan to "Control" your process/solution.

For our project we have ...

1.	Created a list of innovative ideas for potential solutions.	YES	NO
2.	Used the narrowing and screening techniques to further develop and qualify potential solutions.	YES	NO
3.	Created a "Solution Statement" for at least two possible proposed improvements.	YES	NO
4.	Made a final choice of our solution based on success criteria and cost/benefit analysis.	YES	NO
5.	Verified our solution with our sponsor and received buy-in and the go-ahead.	YES	NO
6.	Developed a plan for piloting and testing the solution, including a pilot strategy, action plan, results assessment, schedule, etc.	YES	NO
7.	Evaluated pilot results and confirmed that we can achieve the results defined in our Goal Statement.	YES	NO
8.	Identified and implemented refinements to the solution based on lessons from the pilot.	YES	NO
9.	Created and put in place a plan to expand the solution—with refinements—to a complete implementation.	YES	NO
10.	Considered potential problems and unintended consequences of the solution and developed preventive and contingent actions to address them.	YES	NO



The major tasks involved in the Control phase of DMAIC are:

1- Assigning responsibility for Process Ownership

2- Creating sustainable Measurement and Monitoring of process performance

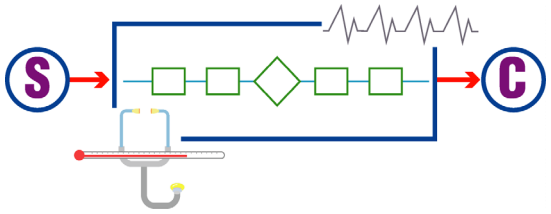
3- Developing usable and accessible Process Documentation and Revision Plans

4- Integrating the control effort using tools such as Process Dashboards, Customer Scorecards, and Response Plans

Monitoring & Control

- **Processes defined & documented**
- **Measures provide feedback**
  - Financial, process, people, innovation
- **Management of flow and function**
  - Process ownership
  - Cross-functional coordination
- **Improvement & Design/Redesign as needed**
- **Key skills:**
  - Data management
  - Collaboration
  - Proactive management

Six Sigma Process Management



Control Checklist

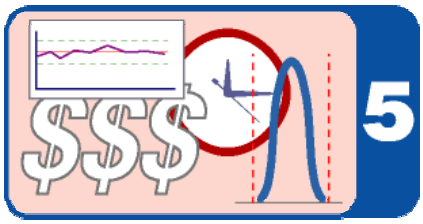
Instructions:

If you can respond "yes" to each statement below, you've completed all key steps in your DMAIC project and are ready to *celebrate* and maintain your improvement.

For our project we have ...

1.	Compiled results data confirming that our improvement/design has achieved the Goal defined in our DMAIC team Charter.	YES	NO
2.	Selected ongoing measures to monitor performance of the process and continued effectiveness of our solution/design.	YES	NO
3.	Determined key charts/graphs for a "Process Dashboard."	YES	NO
4.	Prepared all essential documention of the revised process, including key procedures and process maps.	YES	NO
5.	Identified an "owner" of the process who will take over responsibility for our solution/design and for managing continuing operations.	YES	NO
6.	Developed (with the process owner) Process Management Charts detailing requirements, measures and responses to problems in the process.	YES	NO
7.	Prepared a Storyboard documenting the team's work to date and key learnings.	YES	NO
8.	Forwarded other issues/opportunities which we were *not* able to address to senior management.	YES	NO
9.	Celebrated the hard work and successful efforts of our team!!	YES	NO

Expand & Integrate the System



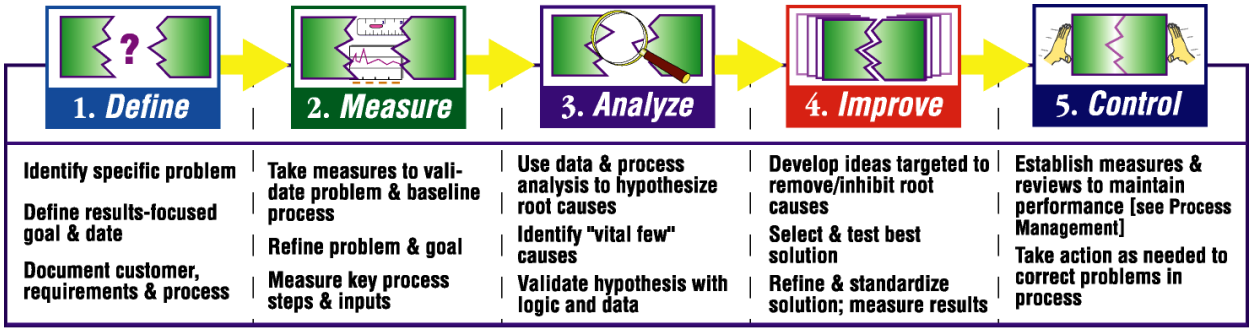
What:

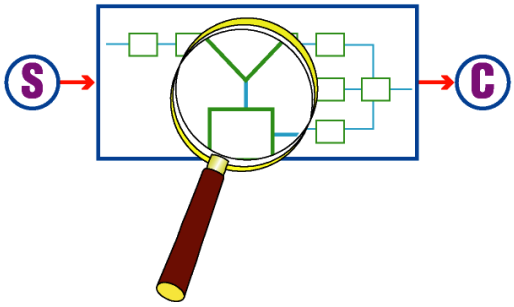
- **Control & sustain gains; Install "Core Competencies"**

Why:

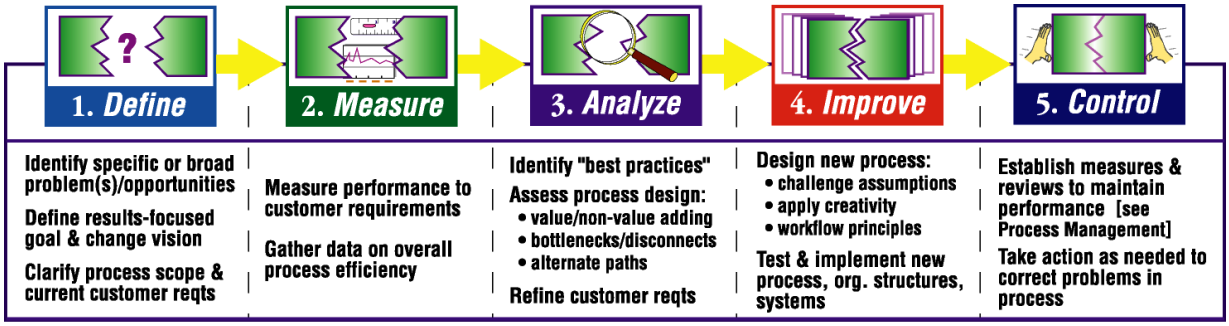
- **Improvement & Design results can fade**
- **Old habits can take over**
- **Building Customer, Process & Data-focus requires new methods & structures**

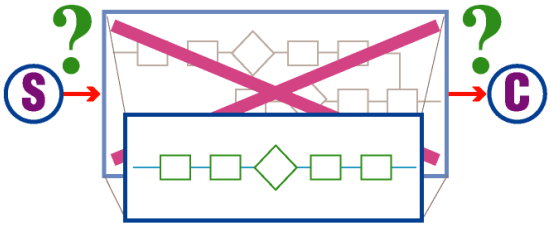
Six Sigma Improvement Path



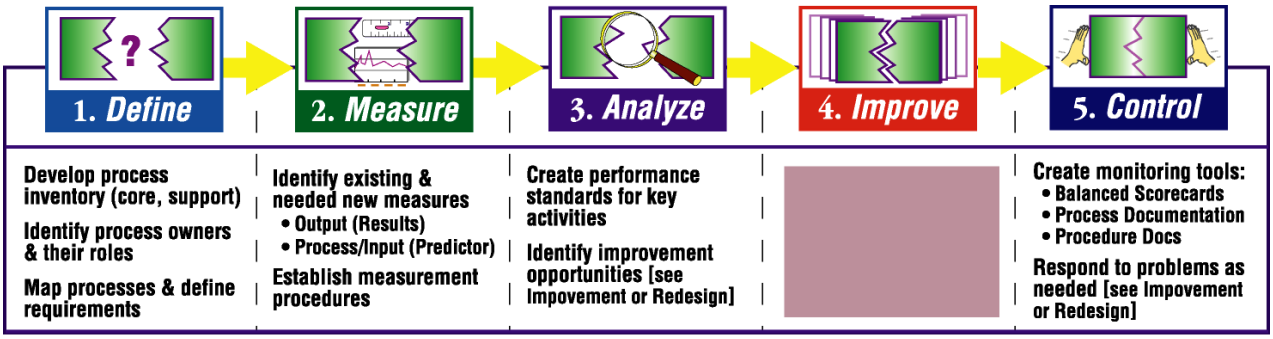


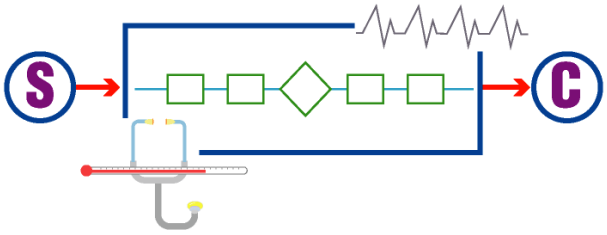
Six Sigma Design/Redesign Path





Process Management Path





SIX SIGMA LEADERSHIP

Planning for Six Sigma

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Ideals for Implementation

- **Driven by leaders at highest level**
  - Supporting infrastructure
- **Projects selected should:**
  - Directly impact external customers
  - Reduce costs & waste
  - Increase yield & capacities
  - Have an ongoing support system
- **Include support/enabling processes**
- **Align with existing initiatives**
- **Provide for effective, timely training**
- **Incorporate company-wide communications**

Building a Case for Six Sigma

- **Consider others' perspectives**
  - Respect their views & concerns
  - Ask their opinions & help
  - Look for personal impact/benefit (WIIFM)
- **Sell ideas rationally & emotionally**
  - Tie to business strategy, critical needs
  - Problems & goals backed by facts
  - Clear priorities
  - Include a "vision" for change
- **Have a "marketing plan"**
  - Communicate with key players—avoid surprises
  - Apply "strategic selling"
  - Analyze & learn from objections

Preparing for a Change Effort

R = Q x A

- **What will be the "case for change"?**
- **Who needs to be "sold"?**
  - Evaluate Stakeholders
- **How will the message be communicated?**
- **Is consensus clear at the Leadership level?**
- **How will efforts be coordinated with internal customers/partners?**

"Elevator Speech"

A concise, consistent message ...

Compose elements of a description of your company's Six Sigma effort:

What is it? Rationale?

Expected benefits? Planned activities?

Participation/responsibilities of the listener…

Key Implementation Decisions

➢ Determine Objective for Six Sigma

- Define a vision for change: Solve problems? and/or Change culture?
- How does Six Sigma align with current strategies & past initiatives?

➢ Assess readiness for change

- What is the level of support within leadership? Who are the advocates?

➢ Define leadership roles/structure

- Make-up of Deployment Team?"
- Responsibilities of the Senior Leaders?
- Identity and responsibilities of Champions and/or Process Owners?

➢ Plan pace of roll-out

- Pilot? Full-scale?
- How will the current infrastructure support the effort?

Implementation Decisions (cont'd)

➢ Identify target areas for improvement

- Utilize current systems and/or data?
- Additional activities to further assist in project identification?

➢ Identify activities to meet objectives

- Project selection & execution, additional process management systems, development of support infrastructure, VOC systems?
- Types of training/coaching required to support those activities?

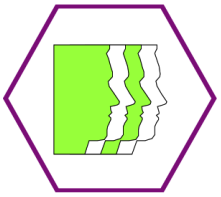
➢ Prepare budgets, resources

- Full-time Black Belts? Green Belts? and related HR issues?
- Number of projects? Deployment and leveraging of resources?

➢ Communication Plan

- How will activities and/or results be communicated to the organization?

Six Sigma "Success Factors"



CUSTOMER FOCUS

- **Identifying current needs**
- **Anticipating future needs, value-adding opportunities**
- **Designing work to deliver on needs and expectations**
- **Making (& keeping) realistic commitments**
- **Balancing retention (service) and acquisition (sales)**

Six Sigma "Success Factors"

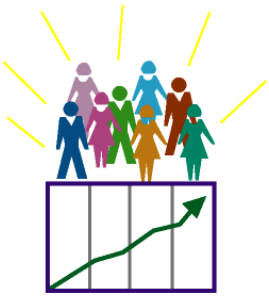
PROCESS FOCUS

- Understanding how work gets done — & why
- Clarifying customer/supplier interfaces
- Managing for effectiveness & efficiency
- "Blaming" the process versus the people
- Balancing standardization with flexibility

Six Sigma "Success Factors"

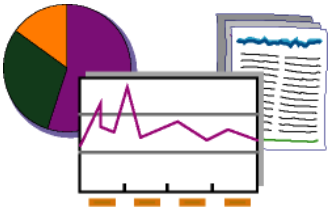
PROACTIVE MANAGEMENT

- **Testing/challenging assumptions**
- **Setting & reviewing clear objectives**
- **Staying "ahead of the curve"**
  - Planning & prevention
  - Continuous improvement
  - Responding promptly, not hastily



- **Avoiding "reactive" behavior**
  - Solving problems at the root cause
  - Minimizing recovery & discouraging pure heroism
- **Thinking creatively**

Six Sigma "Success Factors"



MANAGEMENT-BY-FACT

- Asking questions, gathering data
- Tracking predictors as well as results
- Establishing measurement systems
- Using criteria and information for decisions
- Supporting "intuition" with knowledge

Six Sigma "Success Factors"

BOUNDARYLESS COLLABORATION

- **Leading by example, involvement**
- **Encouraging individual initiative**
- **Aligning accountability/incentives "end-to-end"**
  - Valuing collaboration & shared successes
  - Avoiding cross-purposes
- **Eliminating functional barriers/conflicts**
- **Building "whole process" knowledge**